



A Stereo-Atlas of Ostracod Shells

edited by R.H. Bate, J.W. Neale, Lesley M. Sheppard
and David J. Siviter

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Instructions to Authors

Contributions illustrated by scanning electron micrographs of Ostracoda in stereo-pairs are invited. Full instructions may be obtained on request from any one of the Editors or Editorial Board. Format should follow the style set by the majority of papers in this issue. Descriptive matter apart from illustrations should be cut to a minimum; preferably each plate should be accompanied by one page of text only. Blanks to aid in mounting figures for plates may be obtained from the Editors. Completed papers should be sent to Ms. L. M. Sheppard, Department of Palaeontology, British Museum (Natural History), Cromwell Road, London SW7 5BD.

Acknowledgments

This Volume of the *Stereo-Atlas* has been aided by generous financial support from Robertson Research International Limited.

Stereo-viewing for users of the Atlas

In order to obtain maximum information and benefit from the use of the *Stereo-Atlas* it is essential that the user view the micrographs stereoscopically. Small pocket-sized stereo-viewers are most suitable for this purpose. Two suppliers are:

C. F. Casella & Co. Ltd., Regent House, Britannia Walk, London N1 7ND and
Air Photo Supply Corp., 158 South Station, Yonkers, New York 10705. U.S.A.

The front cover shows a female right valve and juvenile left side of **Hemicytherura videns** (Müller).

Plates reproduced by United Printing Services, Blackpool, England.

ON *HEMICYTHERURA CELLULOSA* (NORMAN) Emendby John E. Whittaker
(British Museum (Natural History), London)Genus *HEMICYTHERURA* Elofson, 1941Type-species (subsequent designation by Elofson, 1941): *Cythere cellulosa* Norman, 1865

Diagnosis: Adult carapace small (usually <0.4mm), heavily calcified with large excavated fossae; sola of fossae reticulate. Large eye spot and caudal process present. Pore conuli well developed, pores of simple type. Internally, hinge of left valve with terminal crenulate sockets and intervening median bar with dentate extremities. Calcified inner lamella broad anteriorly, narrow posteriorly. Vertical row of four adductors, with one frontal scar. Males smaller than females and more elongate.

Remarks: The shape and subdivision of the fossae are of prime importance for specific differentiation. It is probably also a diagnostic feature of the genus that the distinctive adult ornamentation is developed only in the final moult, all the instar stages being merely punctate with a fine ghost reticulation.

Explanation of Plate 8, 2

Fig. 1, ♂ LV, ext. lat. (1980.321, 310 µm long); fig. 2, ♀ LV, ext. lat. (1980.322, 360 µm long); fig. 3, ♀ RV, ext. lat. (lectotype, 1980.323, 350 µm long).

Scale A (100 µm; x 175), figs. 1 - 3.

Hemicytherura cellulosa (Norman 1865)

- 1865 *Cythere cellulosa* sp. nov. A. M. Norman, in G. S. Brady, *Nat. Hist. Trans. Northumb.*, 1, 22, pl. 5, figs. 17 - 20 (non pl. 6, fig. 17 = *H. hoskini* Horne, 1981).
 1868 *Cytherura cellulosa* (Norman); G. S. Brady, *Trans. Linn. Soc. Lond.*, 26, 446, pl. 29, figs. 47 - 50 (non pl. 29, fig. 60 = *H. hoskini*).
 1889 *Cytherura concentrica* Brady, Crosskey & Robertson; G. S. Brady & A. M. Norman, *Scient. Trans. R. Dubl. Soc.*, ser. 2, 4, 201 (pars), pl. 17, figs. 28, 29 (= juveniles); non pl. 19, figs. 3, 4.
 1941 *Cytheropteron (Hemicytherura) cellulosa* (Norman); O. Elofson, *Zool. Bidr. Upps.*, 19, 314.
 1973 *Hemicytherura cellulosa* (Norman); J. E. Whittaker, *Stereo-Atlas of Ostracod Shells*, 1, 77, pls. 1:14:78, 80, 82, 84.
 1975 *Hemicytherura cellulosa* (Norman); I. R. Hoskin, *Revta esp. Micropaleont.*, 7, 91, pl. 1, figs. 5, 6; text-figs. 2, 5, 6.

Lectotype: (here designated) Brit. Mus. (Nat. Hist.) no. 1980.323, ♀ RV.

Type locality: Lamlash Bay, Isle of Arran, W Scotland, approx. lat. 55° 32' N, long. 05° 08' W; Recent.

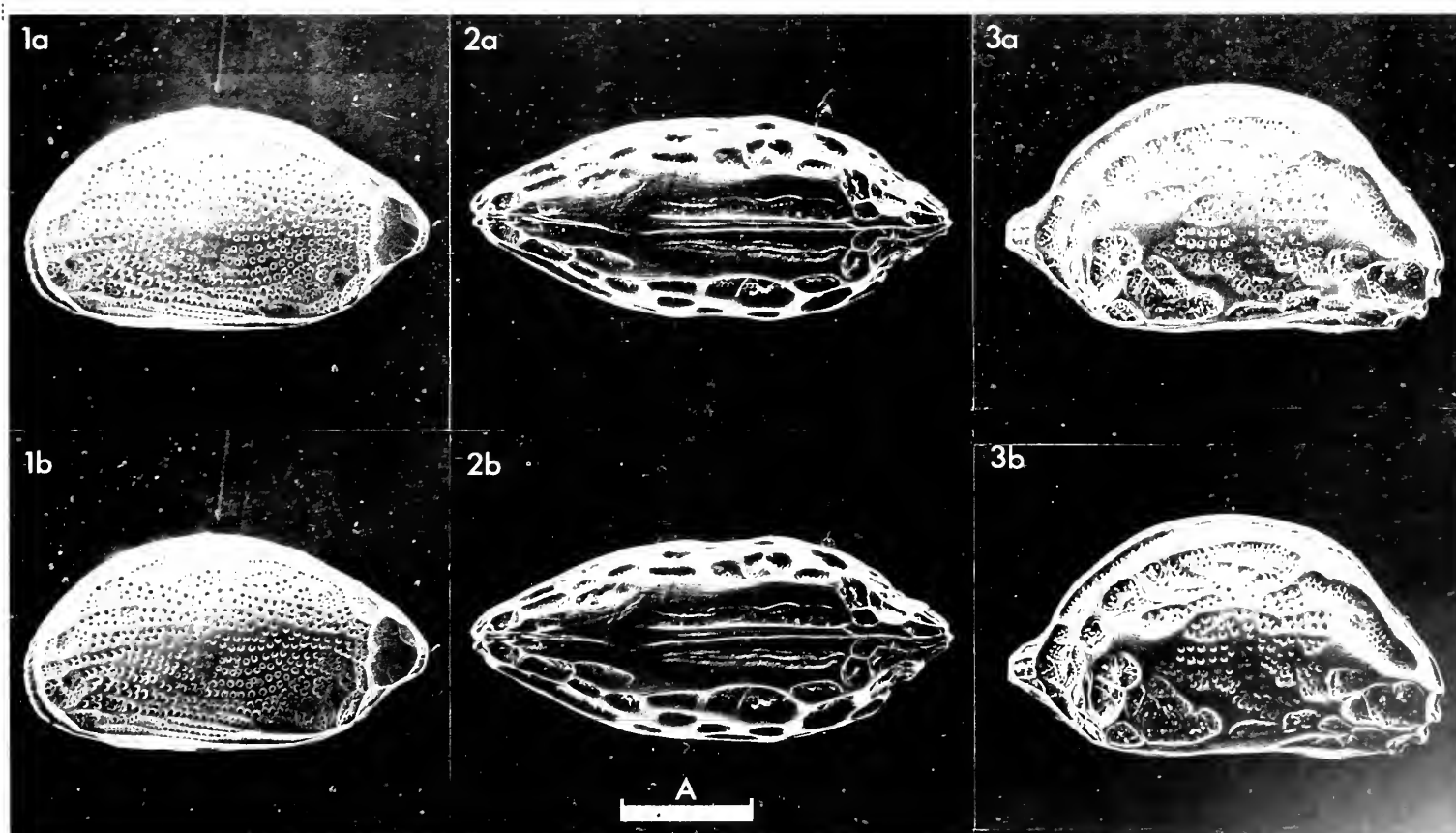
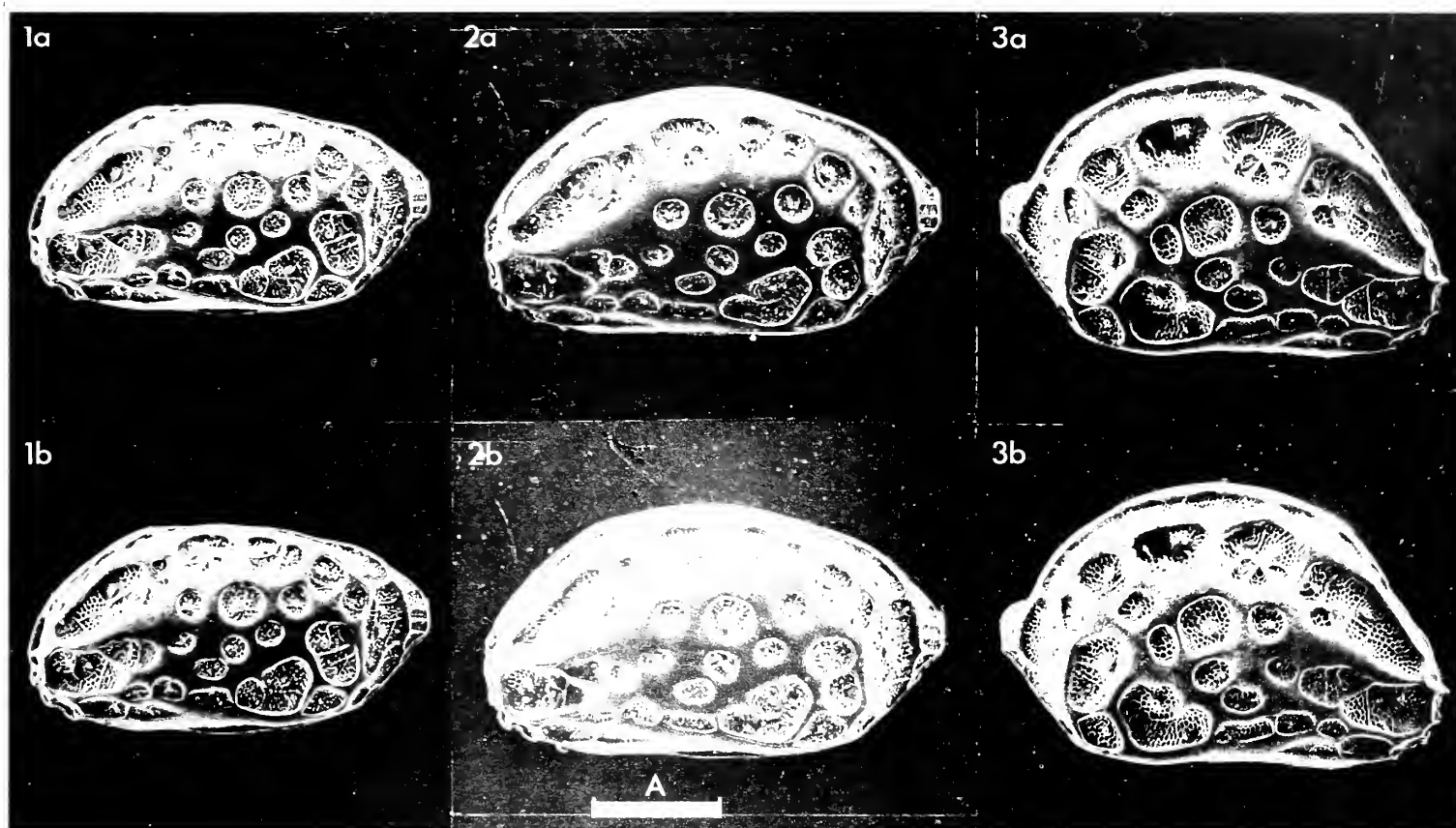
Figured specimens: Brit. Mus. (Nat. Hist.) nos. 1980.321 (♂ LV: Pl. 8, 2, fig. 1), 1980.322 (♀ LV: Pl. 8, 2, fig. 2), 1980.323 (lectotype, ♀ RV: Pl. 8, 2, fig. 3), 1980.324 (juv. -1 LV: Pl. 8, 4, fig. 1), 1980.325 (♀ car.: Pl. 8, 4, fig. 2), 1980.326 (? ♀ RV: Pl. 8, 4, fig. 3), 1980.327 (♂ copulatory appendage: Text-fig. 2).

1980.321, 322, collected alive at low water mark from the red-alga *Plocamium cartilagineum* by D. J. Horne at Gore Point, Porlock, S shore of Bristol Channel, W England, approx. lat. 51° 14' N, long. 03° 37' W; 9th March 1978; salinity 31.7‰, water temperature 9°C. 1980.323 collected at type locality in 1854 by A. M. Norman (ex Norman Coll. slide no. 1911.11.8.M 3666). 1980.324 from green-algae at Bran Point, Weymouth Bay, S England, approx. lat. 50° 38' N, long. 02° 22' W; collected by J. E. Whittaker, 15th August 1968; salinity 34.5‰, water temperature 16°C. 1980.325 from red-algae in 3m of water at Redcliff Point, Weymouth Bay, approx. lat. 50° 38' N, long. 02° 24' W; collected by divers, 6th September 1969; salinity 34.7‰. 1980.326, 327, collected alive by D. J. Horne from mixed intertidal algae, Robin Hood's Bay, NE England, approx. lat. 54° 26' N, long. 00° 32' W; 22nd September 1979.

Explanation of Plate 8, 4

Fig. 1, juv. -1 LV, ext. lat. (1980.324; 320 µm long); fig. 2, ♀ car., ext. vent. (1980.325, 370 µm long); fig. 3, ? ♀ RV, ext. lat., with ornament transitional between juv. and adult (1980.326, 340 µm long).

Scale A (100 µm; x 175), figs. 1 - 3.



Diagnosis: (Using the numerical notation of Hoskin 1975; see Text-fig. 1). Central group of seven subcircular fossae (1^u, 1^m, 1^v, 2, 3ⁿ, 5ⁿ, 9ⁿ), of which all but 3ⁿ and 9ⁿ are distinctly separated from surrounding fossae. Caudal process short. Viewed ventrally, female carapace subovate, greatest width behind mid-point. Distal lappet of male copulatory appendage, broad, short and curved.

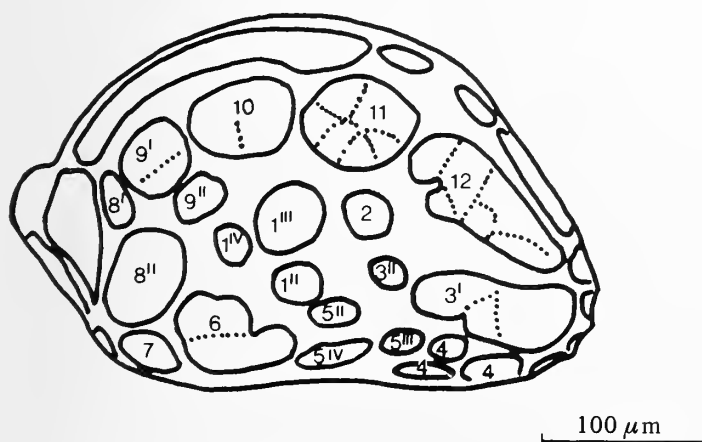
Remarks: An emended version of my paper (*op. cit.*) is occasioned by Hoskin's discovery (1975) of two species of *Hemicytherura* in British waters, and that both Norman (1865) and Brady (1868), had in fact figured the two, unbeknown to themselves and all subsequent workers. Hoskin's identification of the second species as *H. videns* (Müller) is shown elsewhere (Horne, *Stereo-Atlas of Ostracod Shells*, 8, 13, 1981) to be incorrect, and a new species, *H. hoskini* Horne, is erected.

In order therefore, to redefine *H. cellulosa* in the light of this discovery, a lectotype is chosen (Pl. 8, 2, fig. 3) from the remaining syntypic material in the Brit. Mus. (Nat. Hist.). Of the two slides still extant, both of which incidentally contain *only* *H. cellulosa* s.s., that from Lamlash Bay contained the best preserved material. A new diagnosis is also presented.

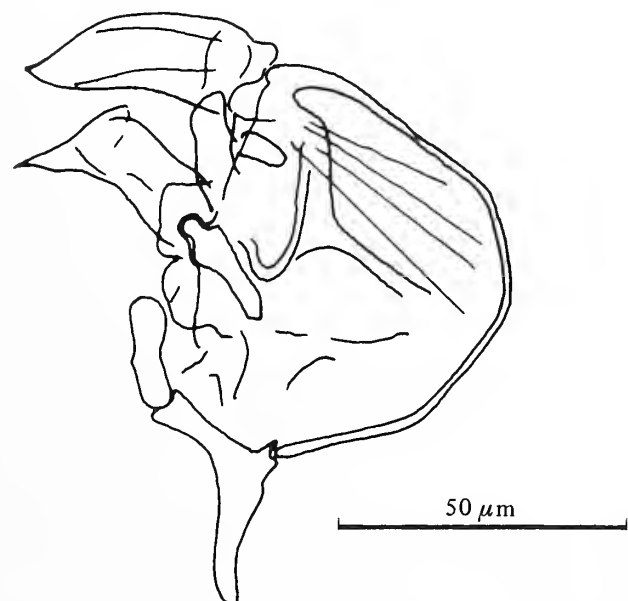
H. cellulosa differs from *H. hoskini* particularly in the subdivision of fossae 9 and 1, in the shape of the carapace in lateral and ventral/dorsal view and in the shape of the distal lappet of the male copulatory appendage.

Pl. 8, 4, fig. 3 shows a curious specimen, the only one so far discovered, which has the size and shape of an adult female, but possesses a mixture of adult (around the outer margins) and juvenile (mid-region) ornament. The valves are fully calcified so the possibility that the individual was 'caught' in the process of moulting must be ruled out. Rather, it is suggested the specimen represents some form of genetic damage, which might not be uncommon, but which is particularly apparent in this case as the difference in ornament between the penultimate instar and adult carapaces is normally so marked in *Hemicytherura*.

Distribution: Recent, marine phytal species: coasts of NW Europe from France to Norway; records elsewhere still await confirmation. Sub-Recent: Holland (Wagner, *Sur les Ostracodes du Quaternaire recent des Pays-Bas*. , Mouton & Co., The Hague, 76, 1957).



Text-fig. 1. *Hemicytherura cellulosa* (Norman). Generalized sketch of ♀ RV with Hoskin's (1975) numerical notation of the fossae. Drawing by J. Athersuch.



Text-fig. 2. *Hemicytherura cellulosa* (Norman). ♂ copulatory appendage (1980.327). Robin Hood's Bay, NE England. Dissection and drawing by D. Horne.

ON *HEMICYTHERURA AEGYPTICA* HARTMANN

by Ann R. Gurney

*British Museum (Natural History), London**Hemicytherura aegyptica* Hartmann, 1964

- 1964 *Hemicytherura videns aegyptica* subsp. nov. G. Hartmann, *Kieler Meeresforsch.*, 20, 50, pl. 13, fig. 61, pl. 14, figs. 62 - 66.
- 1975 *Hemicytherura videns aegyptica*; I. R. Hoskin, *Revta esp. Micropaleont.*, 7, 92 et seq., text-fig. 1 (5).

Holotype: Zoologisches Museum, Universität Hamburg, no. 28000, ♀ car.; separated into LV & RV on slide; RV figured herein.

[*Paratypes*: Zoologisches Museum, Universität Hamburg, no. 28213, ♂ copulatory appendage on slide and specimens in alcohol].

Explanation of Plate 8, 8

Fig. 1, ♂ ext. lt. lat. (1980.351, 300 µm long); fig. 2, ♀ ext. lt. lat. (1980.352, 320 µm long); fig. 3, ♀ ext. rt. lat. (holotype, 28000, 330 µm long).

Scale A (100 µm; x 175), figs. 1 - 3.

Type locality: Ghardaqa (Hurghada), Egyptian coast of Red Sea, approx. lat. 33° 05' N, long. 27° 02' E; Recent.

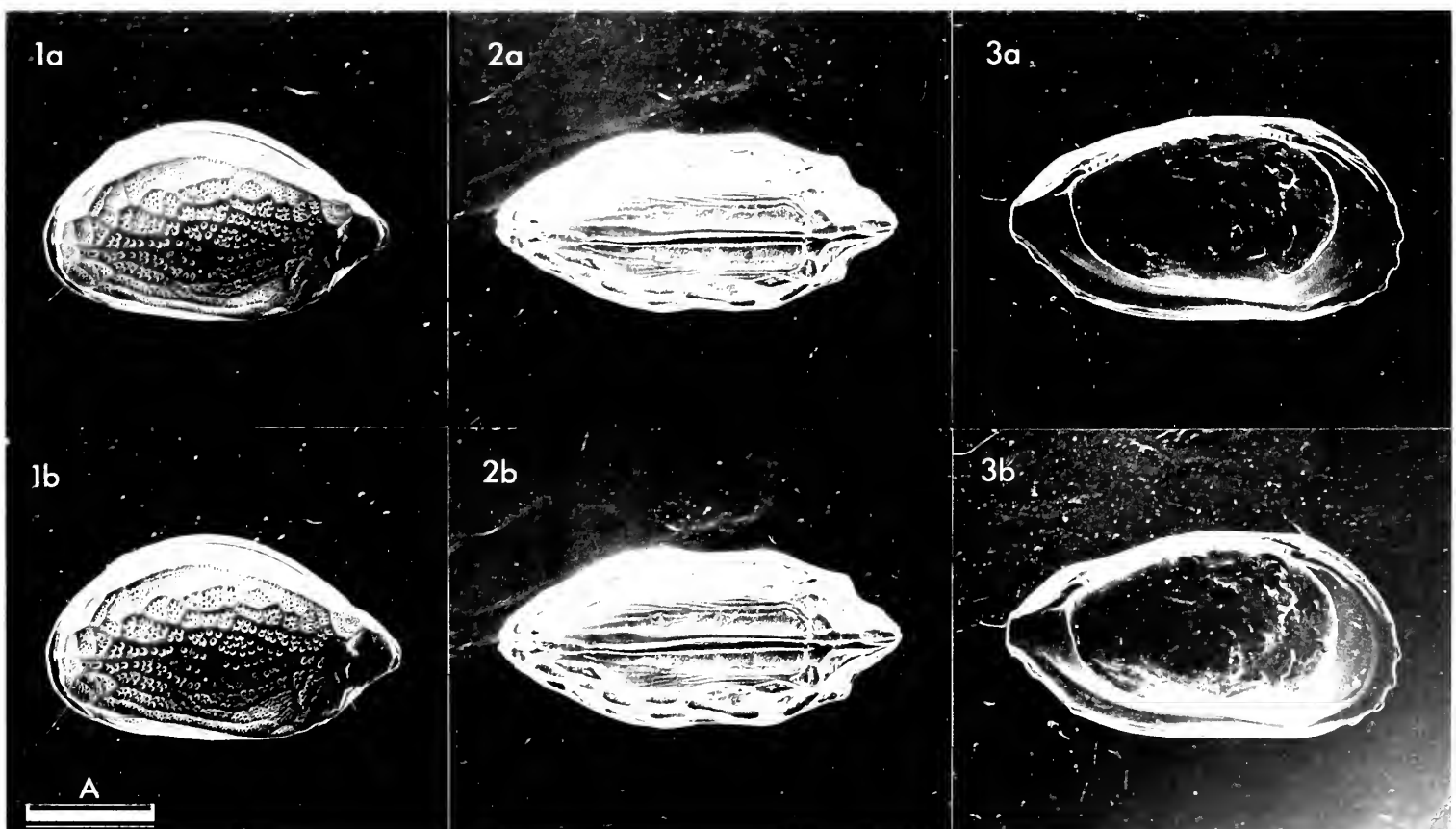
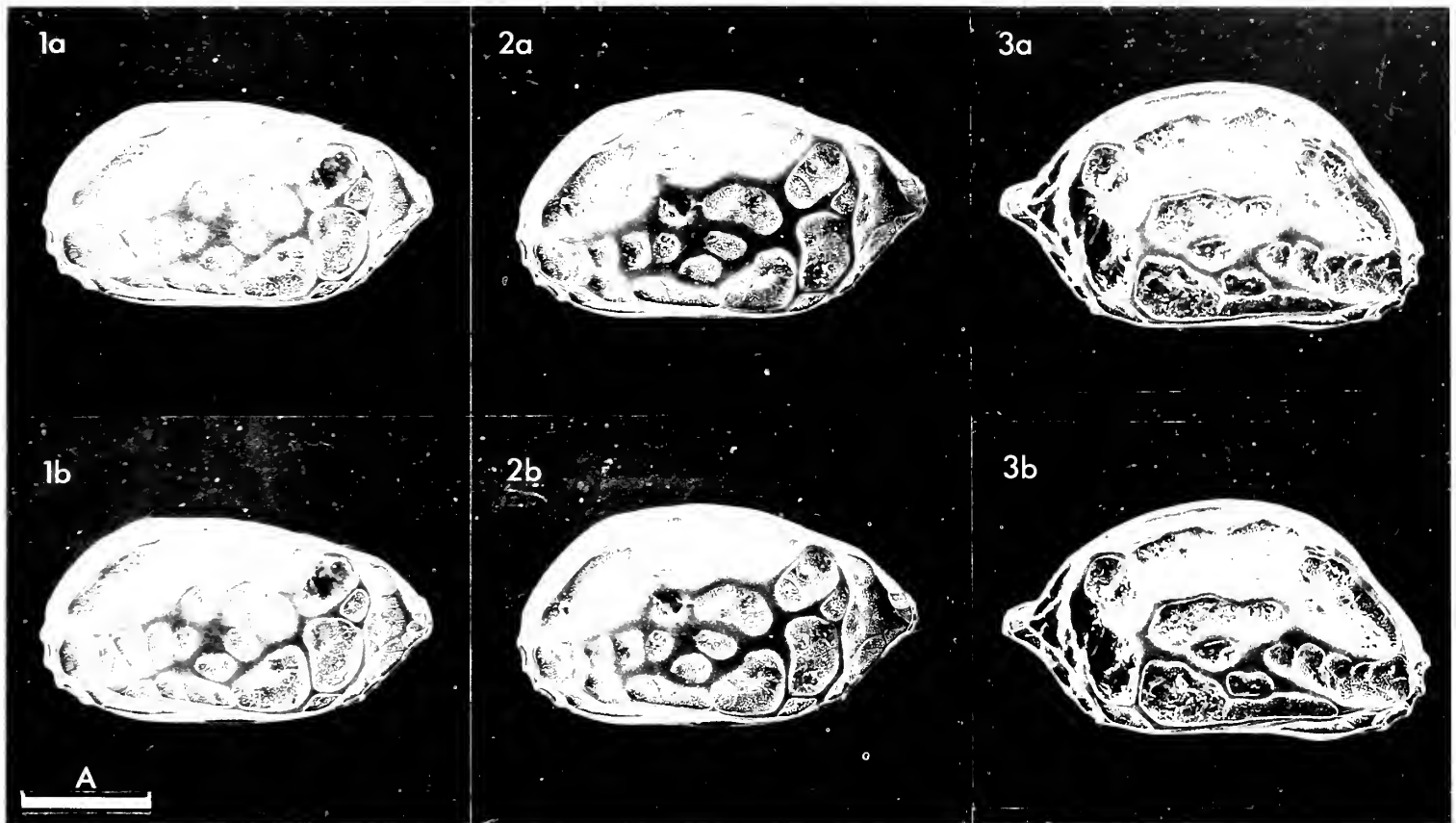
Diagnosis: (Using the numerical notation of Hoskin 1975; see Text-fig. 1.) Central group of five fossae (1', 1'', 2, 3'', 5'') of which all but 3'' are distinctly separated from the surrounding fossae by a thick murus. Viewed ventrally, female carapace widest in front of mid-point. Distal lappet of male copulatory appendage long and styliform.

Figured specimens: Brit. Mus. (Nat. Hist.) nos. 1980.351 (♂ LV: Pl. 8, 8, fig. 1), 1980.352 (♀ LV: Pl. 8, 8, fig. 2), 1980.353 (juv. -1 car.: Pl. 8, 10, fig. 1), 1980.354 (♀ car.: Pl. 8, 10, fig. 2), 1980.355 (♂ LV: Pl. 8, 10, fig. 3), 1980.356 (♂ copulatory appendage: Text-fig. 3). Zoologisches Museum, Universität Hamburg no. 28000 (holotype, ♀ RV: Pl. 8, 8 fig. 3), no. 28213 (paratype, ♂ copulatory appendage: Text-fig. 2). Specimens 1980.351 - 356 are Recent from oolite delta, seaward side of Essadiyat Is., Abu Dhabi lagoon, Arabian Gulf, approx. lat. 24° 28' N, long. 54° 25' E; collected by Dr. G. Evans, Imperial College, London. Specimen no. 28000 is from the type locality. Specimen no. 28213 is from Abomingar, a coral island, Egyptian coast of Red Sea, approx. lat. 33° 05' N, long. 27° 02' E; Recent.

Explanation of Plate 8, 10

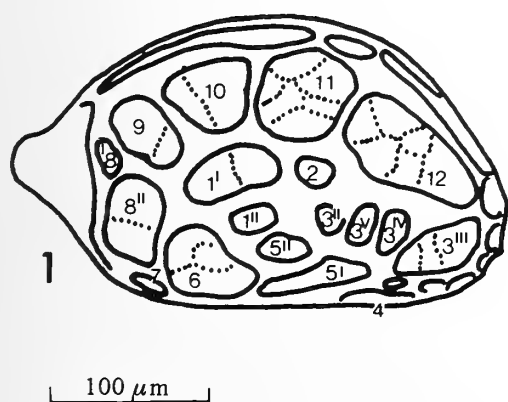
Fig. 1, juv. -1 car., ext. lt. lat. (1980.353, 270 µm long); fig. 2, ♀ car., vent. (1980.354, 310 µm long); fig. 3, ♂ LV int. lat. (1980.355, 310 µm long).

Scale A (100 µm; x 175), figs. 1 - 3.

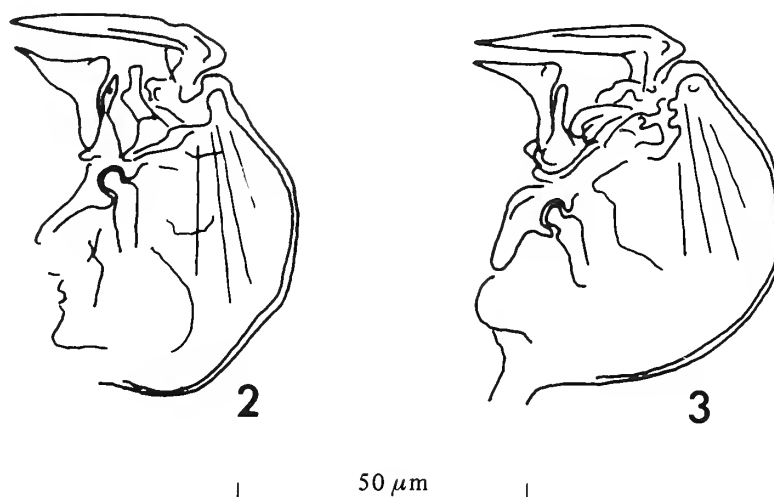


Remarks: Through the kindness of Professor G. Hartmann, it has been possible to re-examine the holotype of *H. videns aegyptica* by scanning electron microscopy. This taxon is now considered to be sufficiently distinct from *H. videns* (Müller) (see Athersuch, *Stereo-Atlas of Ostracod Shells*, 8, 19, 1981) to warrant separate specific status. Material from the Arabian Gulf was identified as *H. aegyptica* following a comparison of the fossal patterns of the shell and male copulatory appendages (compare Text-figs. 2, 3) with those of the Red Sea material.

Distribution: Material is recorded from the Red Sea by Hartmann (1964) and Abu Dhabi lagoon, Arabian Gulf in this paper.



Text-fig. 1. *Hemicytherura aegyptica* Hartmann. Generalised sketch of a ♀ RV, with Hoskin's (1975) numerical notation of the fossae. Drawing by J. Athersuch.



Text-figs. 2, 3. *Hemicytherura aegyptica* Hartmann; ♂ copulatory appendages. Text-fig. 2, Abomingar Is., Red Sea (28213); Text-fig. 3, Essadiyat Is., Arabian Gulf (1980.356). Dissections and drawings by D. Horne.

ON *HEMICYTHERURA HOSKINI* HORNE sp. nov.

by David J. Horne
(City of London Polytechnic, England)

Hemicytherura hoskini sp. nov.

- 1865 *Cythere cellulosa* sp. nov. A. M. Norman, in G. S. Brady, *Nat. Hist. Trans. Northumb.*, 1 (pars), 22, pl. 6, fig. 17 (non pl. 5, figs. 17 - 20).
1868 *Cytherura cellulosa* (Norman); G. S. Brady, *Trans. Linn. Soc. Lond.*, 26 (pars), 446, pl. 29, fig. 60 (non pl. 29, figs. 47 - 50).
1975 *Hemicytherura videns videns* (Müller); I. R. Hoskin, *Revta esp. Micropaleont.*, 7, 91, text-fig. 2 (1 - 4), pl. 1, figs. 1 - 4.

Holotype: Brit. Mus. (Nat. Hist.) ♀ no. 1980.345 (LV) no. 1980.346 (RV).

[Paratypes: nos. 1980.344, 1980.347 - 350. Further paratypes, one ♂ and two ♀ carapaces from the same sample as the holotype, are deposited in the City Museum, Bristol, no. Cd 580 - 582].

Type locality: On the S shore of Bristol Channel at Gore Point, Porlock, Somerset, W England; approx. lat. 51° 14' N, long. 3° 37' W; Recent.

Derivation of name: After Dr. I. R. Hoskin, the author who first distinguished this species from *H. cellulosa*.

Explanation of Plate 8, 14

Fig. 1, ♂ LV, ext. lat. (1980.344, 300 µm long); fig. 2, ♀ LV, ext. lat. (holotype, 1980.345, 320 µm long); fig. 3, ♀ RV, ext. lat. (holotype, 1980.346, 320 µm long).

Scale A (100 µm; x 175), figs. 1 - 3.

Figured specimens: Brit. Mus. (Nat. Hist.) nos. 1980.344 (♂ LV: Pl. 8, 14, fig. 1), 1980.345 (holotype, ♀ LV: Pl. 8, 14, fig. 2), 1980.346 (holotype, ♀ RV: Pl. 8, 14, fig. 3), 1980.347 (♂ car.: Pl. 8, 16, fig. 1), 1980.348 (♀ car.: Pl. 8, 16, fig. 2), 1980.349 (♀ LV: Pl. 8, 16, fig. 3), 1980.350 (♂ copulatory appendage: Text-fig. 2).

Nos. 1980.344 - 346, 348, 349 were collected alive by the author at the type locality on 9.3.1978, on the red alga *Plocamium cartilagineum*, at low water mark on a spring tide; salinity 31.7‰, water temperature 9.0°C. Nos. 1980.347, 350 were collected alive at the type locality on 18.9.1978 on the calcareous alga *Corallina officinalis*, at low water mark on a spring tide; salinity 33.1‰, water temperature 16.0°C, pH 8.3.

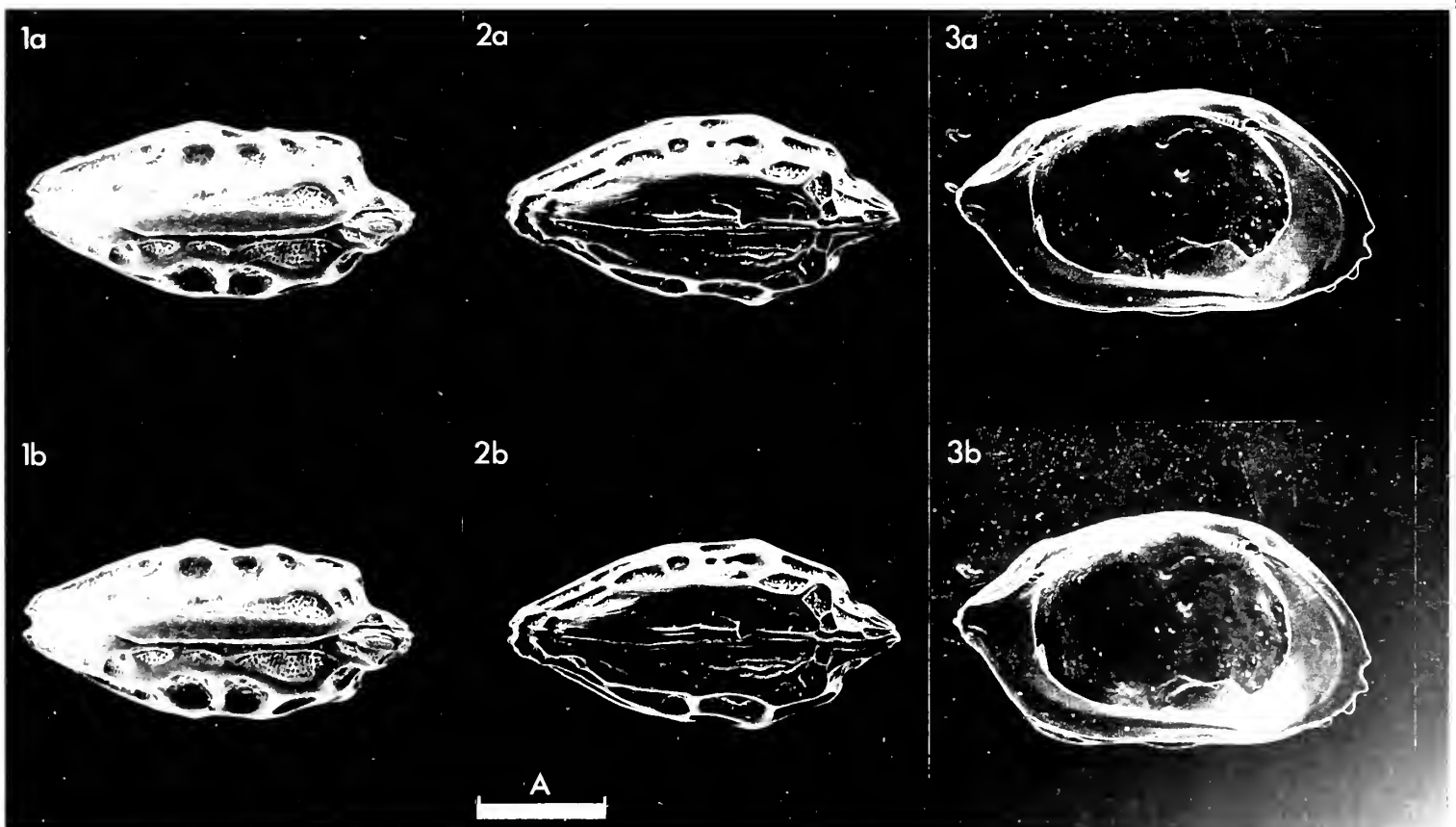
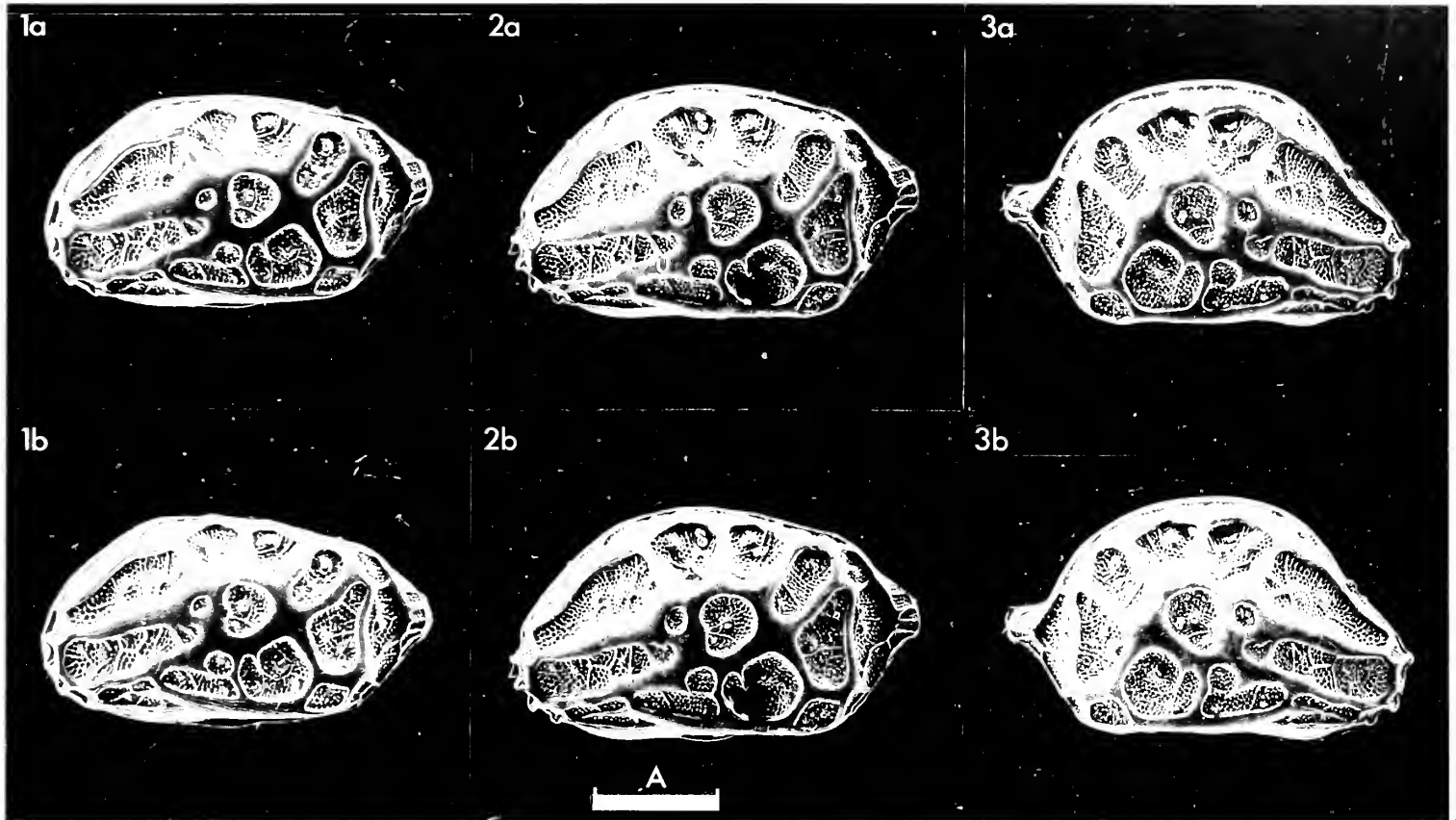
Diagnosis: (Using the numerical notation of Hoskin 1975; see Text-fig. 1.) Central group of fossae of which only 1 and 2 are distinct, while 3" and 5" are separated only partially or weakly from 3' and 5' respectively. Viewed ventrally, female carapace widest behind mid-point. Distal lappet of male copulatory appendage blade-like, acuminate, with a characteristic step in the inner margin.

Remarks: Hoskin (1975) found that in addition to *H. cellulosa* (Norman) a second species of *Hemicytherura* could be recognised in British waters, the two being distinguished on the basis of variation in the fossal pattern of the adult carapace. He ascribed this second species to *H. videns* (Müller) (see Athersuch, *Stereo-Atlas of Ostracod Shells*, 8, 19, 1981) drawing attention to similarities between specimens from Ireland and *H. videns* from Mediterranean localities. Examination of carapaces and appendages of specimens from Britain and the Mediterranean now shows clearly that the British (herein = *H. hoskini*) may be distinguished from *H. videns* on the basis of carapace morphology and the detailed structure of the male copulatory appendages.

Explanation of Plate 8, 16

Fig. 1, ♂ car., dors., (1980.347, 310 µm long); fig. 2, ♀ car., vent., (1980.348, 330 µm long); fig. 3, ♀ LV, int. lat. (1980.349, 310 µm long).

Scale A (100 µm; x 175), figs. 1 - 3.



Remarks: *H. hoskini* differs from *H. videns* in the arrangement of the central lateral group of fossae, the latter (contd.) having a distinct cluster of five (1', 1'', 2, 3'' and 5''), whereas the former has only two (1 and 2). In lateral view *H. hoskini* is more produced anteriorly; in ventral view it is cuneate, tapering anteriorly for about $\frac{2}{3}$ of its length, while *H. videns* is quadrate and tapers anteriorly for only $\frac{1}{4}$ of its length.

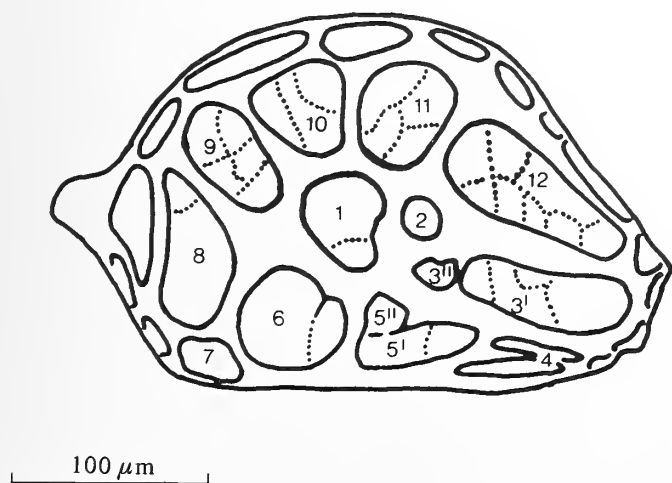
H. cellulosa (see Whittaker, *Stereos-Atlas of Ostracod Shells*, 8, 1, 1981) differs from *H. hoskini* in exhibiting subdivision of fossae 9 and 1, in lateral and ventral outline, and in the shape of the distal lappet of the male copulatory appendage. The present author follows Hoskin (*op. cit.*) in regarding the figures of Norman (1865) and Brady (1868) as representing examples of both British species.

H. aegyptica (Hartmann) (see Gurney, *Stereos-Atlas of Ostracod Shells* 8, 7, 1981) as well as two other Mediterranean species, *H. gracilicosta* Ruggieri and *H. defiorei* Ruggieri, may be distinguished from *H. hoskini* on the basis of fossal patterns.

In most specimens the major fossae are faintly broken up by "ghost" muri (indicated by dotted lines in Text-fig. 1), some of which tend to develop into incipient muri; the resulting occasional subdivisions of fossae 1 and 12, noted by Hoskin (*op. cit.*), were observed in a few specimens from large populations at Gore Point.

Adults and juveniles of the genus *Hemicytherura* are very different in appearance, virtually all of the distinctive adult ornament being added in the final moult (see Whittaker, *Stereos-Atlas of Ostracod Shells*, 1, 77, 1973 and 8, 1, 1981). As yet *H. hoskini* has only been found in samples which also yielded *H. cellulosa*, and it has proved impossible to distinguish between juveniles of the two species with any certainty.

Distribution: Recent. *H. hoskini* is recorded from the Bristol Channel (herein) and the W coast of Ireland (Hoskin, *op. cit.*); it is probably more widespread, having been formerly grouped with *H. cellulosa*. At Gore Point in the Bristol Channel, it was found alive on various algae, within salinity range 31.0 - 33.8‰, on many occasions throughout 1977 and 1978, being most abundant in autumn.



Text-fig. 1. *Hemicytherura hoskini*. Generalised sketch of a ♀ RV with Hoskin's (1975) numerical notation of the fossae.

Drawing by J. Athersuch



Text-fig. 2. *Hemicytherura hoskini*. ♂ copulatory appendage (1980.350).

ON *HEMICYTHERURA VIDENS* (MÜLLER)

by John Athersuch

(B.P. Research Centre, Sunbury-on-Thames, England)

Hemicytherura videns (Müller, 1894)

- 1894 *Cytheropteron videns* sp. nov. G. W. Müller, *Fauna Flora Golf. Neapel*, 21, 303, pl. 20, figs. 2, 8, pl. 21, figs. 15, 16, 18.
 1942 *Cytheropteron (Hemicytherura) videns* Müller; W. Klie, *Zool. Anz.*, 138, 72.
 1953 *Hemicytherura videns* (Müller); G. Ruggieri, *Atti Soc. ital. Sci. nat.*, 92, 49, figs. 4, 4a, 4b, 6, 6a.
 1959 *Hemicytherura videns videns* (Müller); G. Ruggieri, *Ibid.*, 98, 193.
 1972 *Hemicytherura videns videns* (Müller); H. Uffenorde, *Göttinger Arb. Geol. Paläont.*, 13, 88, pl. 9, fig. 9.
 1979 *Hemicytherura videns videns* (Müller); I. Yassini, *Revta esp. Micropaleont.*, 11, 385, pl. 6, fig. 19.

Neotype: Brit. Mus. (Nat. Hist.) no. 1980.338, ♀ RV and LV.

Type locality: Salerno, W Italy, approx. lat. 14° 40' N, long. 14° 46' E; Recent.

Figured specimens: Brit. Mus. (Nat. Hist.) nos. 1980.328 (♂ LV: Pl. 8, 20, fig. 1), 1980.329 (♀ LV: Pl. 8, 20, fig. 2), 1980.330 (♀ RV: Pl. 8, 20, fig. 3), 1980.331 (juv. -1 car.: Pl. 8, 22, fig. 1), 1980.332 (♀ car.: Pl. 8, 22, fig. 2), 1980.333 (♀ LV: Pl. 8, 22, fig. 3), 1980.334 (♂ RV: Pl. 8, 24, fig. 1), 1980.335 (♀ RV: Pl. 8, 24, fig. 2), 1980.336 (♀ LV: Pl. 8, 24, fig. 3), 1980.337 (♂ RV: Pl. 8, 26, fig. 1), 1980.338 (neotype, ♀ RV: Pl. 8, 26, fig. 2), 1980.339 (♀ RV: Pl. 8, 26, fig. 3), 1980.340 - 343 (♂ copulatory appendages: Text-figs. 2 - 5).

Explanation of Plate 8, 20

Fig. 1, ♂ LV, ext. lat. (1980.328, 320 µm long); fig. 2, ♀ LV, ext. lat. (1980.329, 340 µm long); fig. 3, ♀ RV, ext. lat. (1980.330, 340 µm long).

Scale A (100 µm; x 172), figs. 1 - 3.

Figured specimens: Nos. 1980.328 - 332, 337, 341 collected by the author in Cyprus, October 1973: nos. 1980.328 - 330, (contd.) 332, 337 from Kyrenia, approx. lat. 35° 20' N, long. 33° 20' E, on calcareous algae, water temperature 26°C, depth 1.5m; nos. 1980.331, 341 from Amathus, approx. lat. 34° 42' N, long. 33° 09' E, on filamentous algae, water temperature 27°C, depth 1m. Nos. 1980.333 - 336, 342 collected by R. H. Bate from algae in rock pools at Kelibia, Tunisia, approx. lat. 36° 50' N, long. 11° 05' E. Nos. 1980.338, 340, from the type locality, were made available by G. Bonaduce. Nos. 1980.339, 343 from Tenerife, Canary Islands, approx. lat. 28° 15' N, long. 16° 35' W; collected by M. Linley.

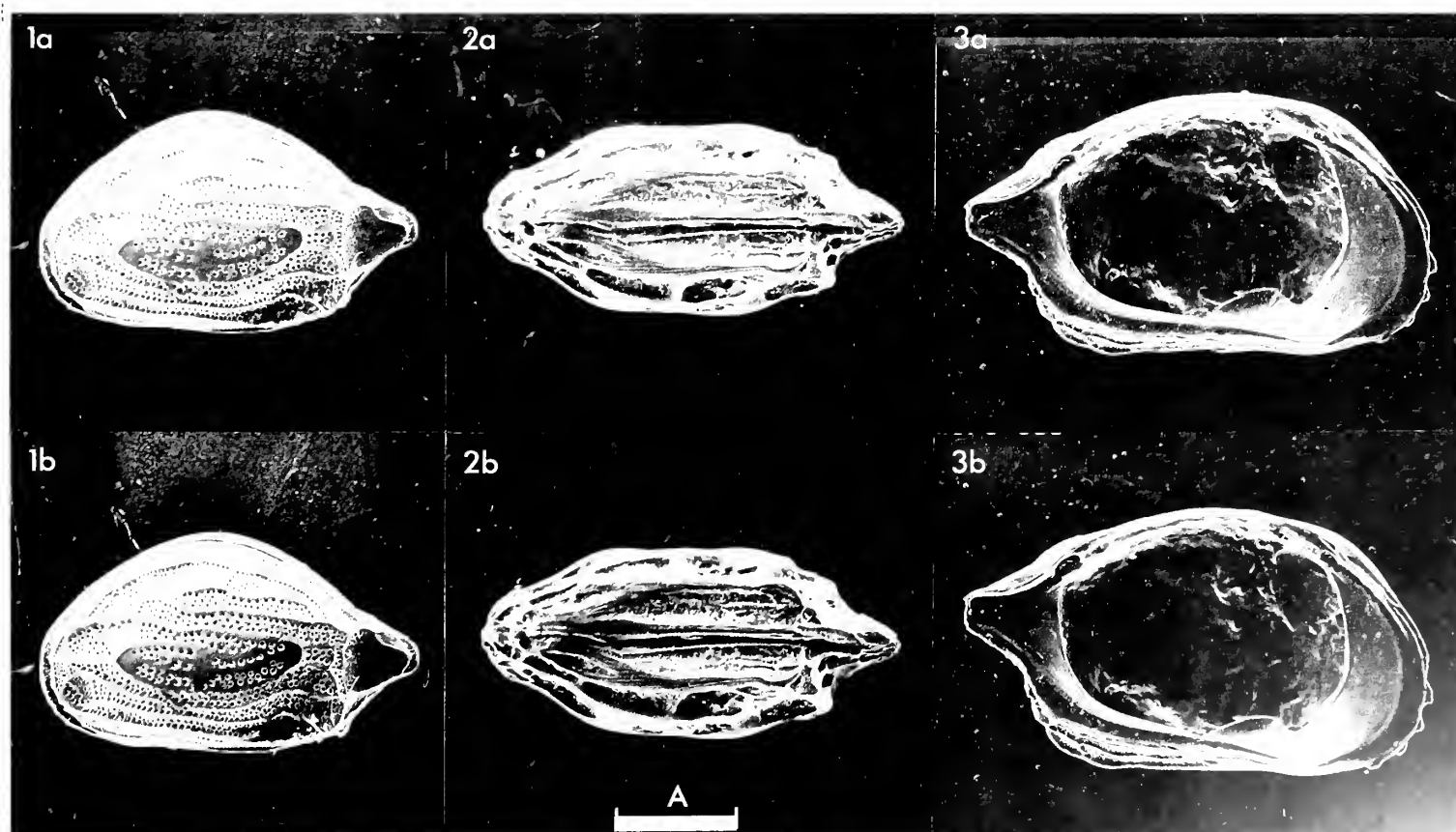
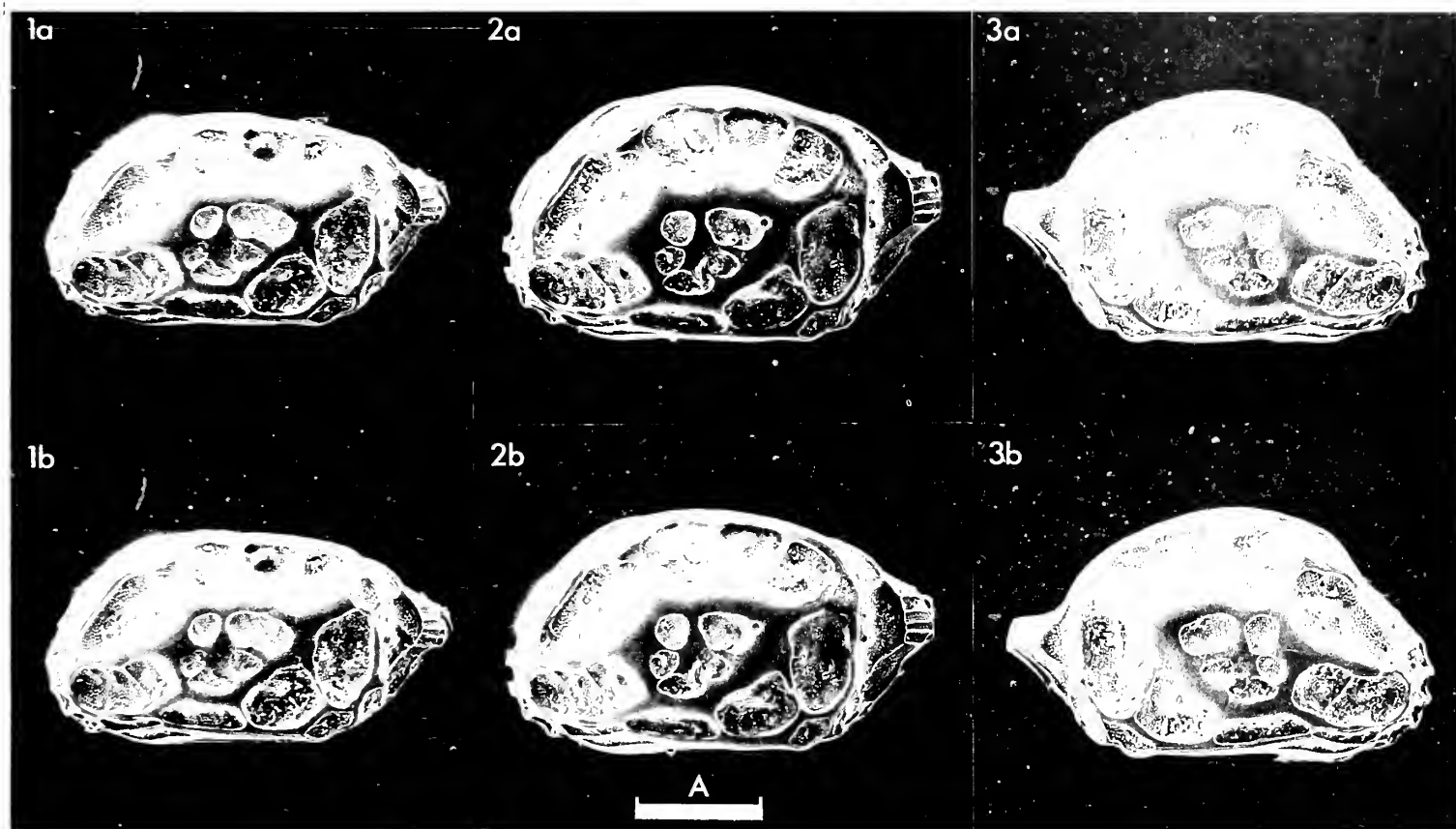
Diagnosis: (Using the numerical notation of Hoskin, 1975; see Text-fig. 1). Distinct central cluster of five fossae (1', 1'', 2, 3'', 5'') separated from surrounding fossae by a wide murus. Carapace highest anteriorly; in ventral view, parallel-sided, tapering abruptly ¼ of length from anterior. Distal lappet of male copulatory appendage, long, curved and acuminate.

Remarks: Hoskin (*Revta esp. Micropaleont.*, 7, 91 1975) distinguished three species of *Hemicytherura* (*H. cellulosa*, *H. videns* and *H. aegyptica*) on the basis of the variation in fossal patterns. His numerical notation of the lateral fossae drew attention to the similarity between *H. videns* from the Mediterranean and specimens of *Hemicytherura* from Ireland which are now considered to belong to a distinct species, *H. hoskini* (see Horne, *Stereo-Atlas of Ostracod Shells*, 8, 13, 1981). *H. videns* may be distinguished from *H. hoskini* by differences in the arrangement of the fossae, in outline and in the detailed structure of the male copulatory appendages. In lateral view, *H. videns* is less produced anteriorly and has a more pronounced caudal process whilst in *H. hoskini*, the right valve is more evenly arched dorsally. In ventral view, *H. videns* is quadrate, tapering anteriorly for about ¼ of its length, whilst *H. hoskini* is more cuneate, tapering anteriorly for about ⅓ of its length. Both *H. cellulosa* and *H. aegyptica* differ from *H. videns* in lateral and ventral outline and in the detailed structure of the male copulatory appendages. In addition, *H. cellulosa* exhibits subdivision of fossa 9 and *H. aegyptica* is characterised by multiple subdivision of fossa 3. Some specimens of *H. videns* show incipient or partial subdivision of fossa 8 and most specimens possess a 'ghost' murus sub-dividing fossa 3'. Rarely fossae 3 and 12 coalesce anteriorly.

Explanation of Plate 8, 22

Fig. 1, juv. -1 car., ext. lt. lat. (1980.331, 300 µm long); fig. 2, ♀ car., ext. vent. (1980.332, 330 µm long); fig. 3, ♀ LV, int. lat. (1980.333, 370 µm long).

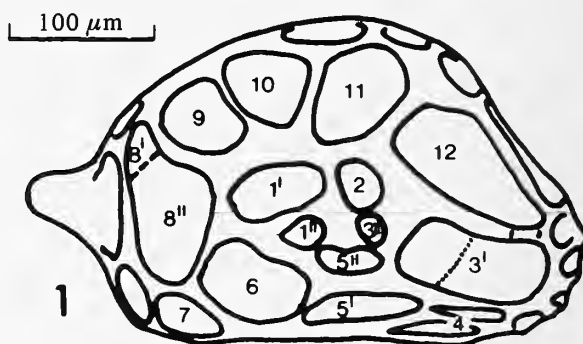
Scale A (100 µm; x 172), figs. 1 - 3.



Remarks: The carapaces of Tunisian specimens of *H. videns* are larger than those from other localities, but are (contd.) identical in all other respects. Specimens from Tenerife, whilst having fossal patterns identical to those seen in individuals from the Mediterranean, differ very slightly in the shape of the carapace; the female right valves of the Tenerife specimens are more evenly arched and have shorter caudal processes (see Pl. 8, 26). Also, the Tenerife specimens differ somewhat from the Mediterranean specimens in the detailed shape of the male copulatory appendages (see Text-figs. 2 - 5). At present, these minor differences are considered to be intraspecific.

Material from the Black Sea was not available to the present author, but specimens illustrated by Schornikov (in: Mordukhai-Boltovskoi, F. D. (Ed.) *Identification key to the fauna of the Black and Azov Seas*, 2, 163, Kiev) as *H. videns* probably do belong to this species, despite minor differences apparent in the fossal patterns and in the detailed structure of the male copulatory appendage.

Since *H. videns* closely resembles several other species and because Müller's specimens are believed to have been lost (Athersuch, *Pubbl. Staz. zool. Napoli*, 40, 1978) a neotype is designated and illustrated herein (Pl. 8, 26, fig. 2).



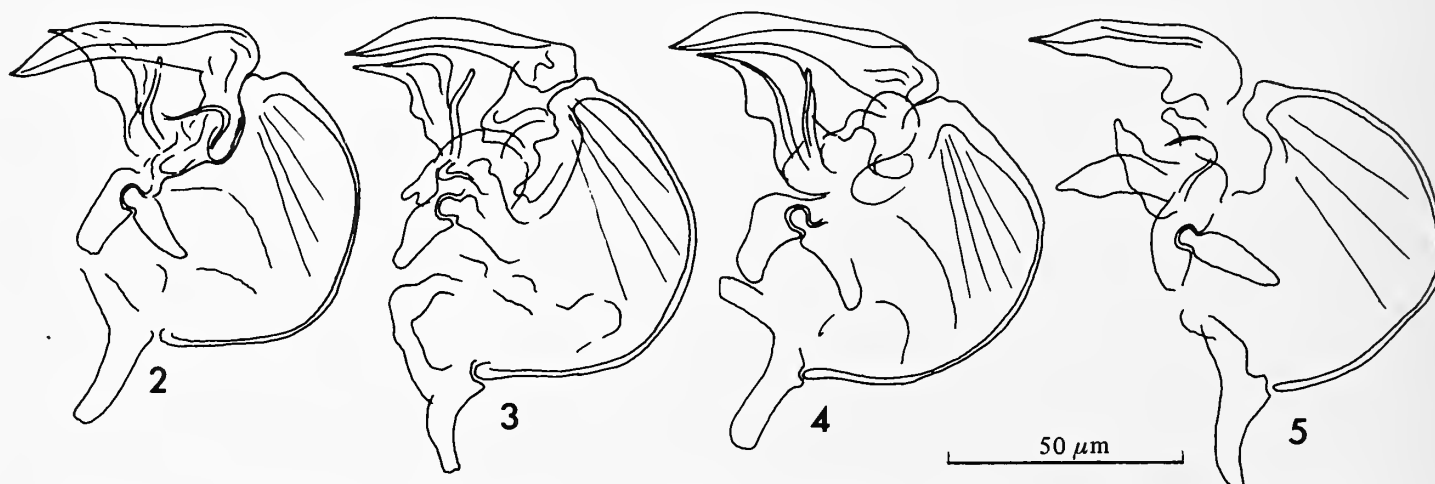
Text-fig. 1. *Hemicytherura videns* (Müller). Generalised sketch of a ♀ RV with Hoskin's 1975 numerical notation of the fossae.

Explanation of Plate 8, 24

Fig. 1, ♂ RV, ext. lat. (1980.334, 370 μm long); fig. 2, ♀ RV, ext. lat. (1980.335, 375 μm long); fig. 3, ♀ LV, ext. lat. (1980.336, 375 μm long).

Scale A (100 μm; x 172), figs. 1 - 3.

Distribution: Recent, phytal marine species: Italy, Cyprus, Tunisia, Tenerife (herein); Adriatic (Uffenorde, *op.cit.*); ? Black Sea (Schornikov, *op.cit.*).



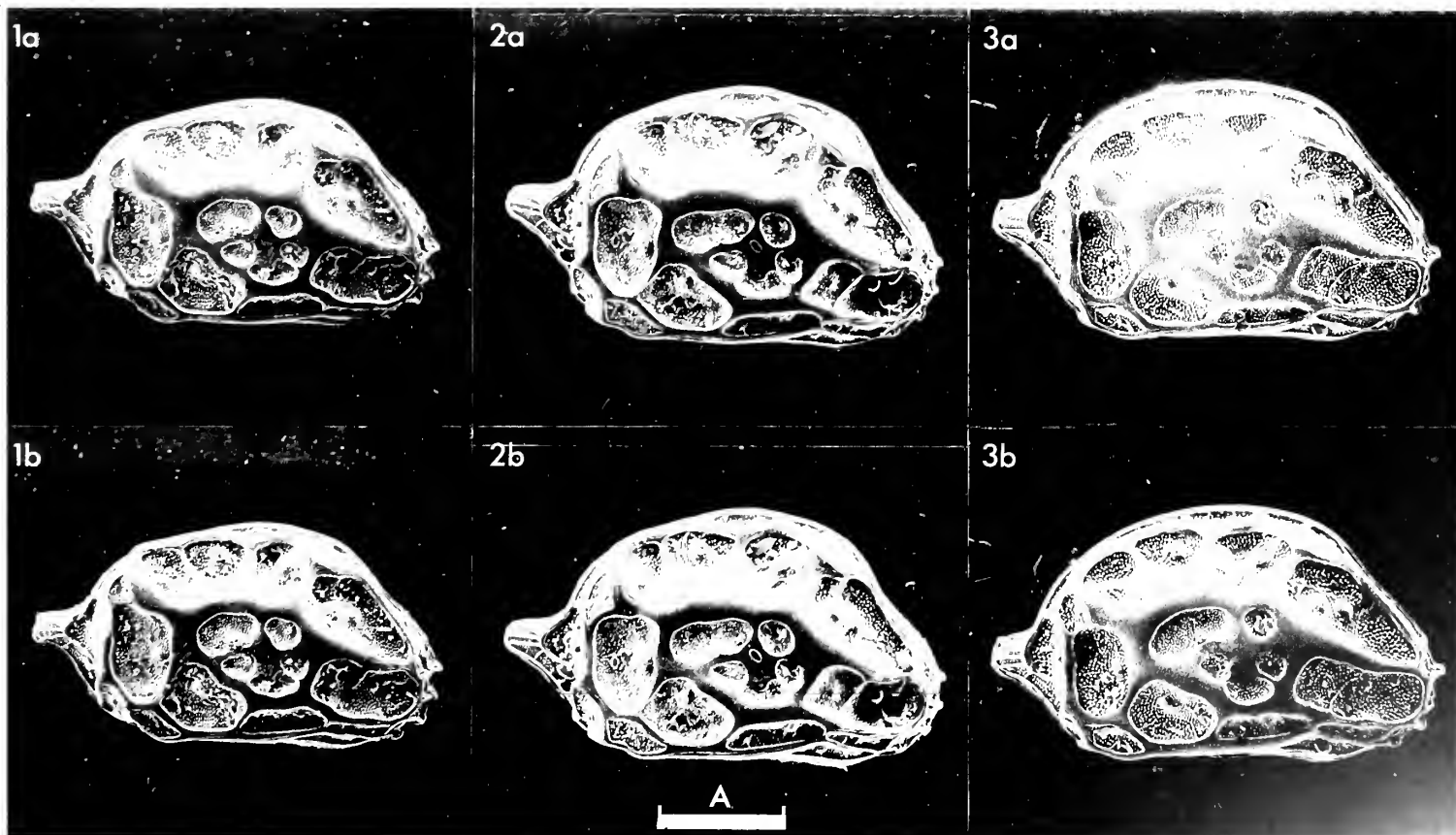
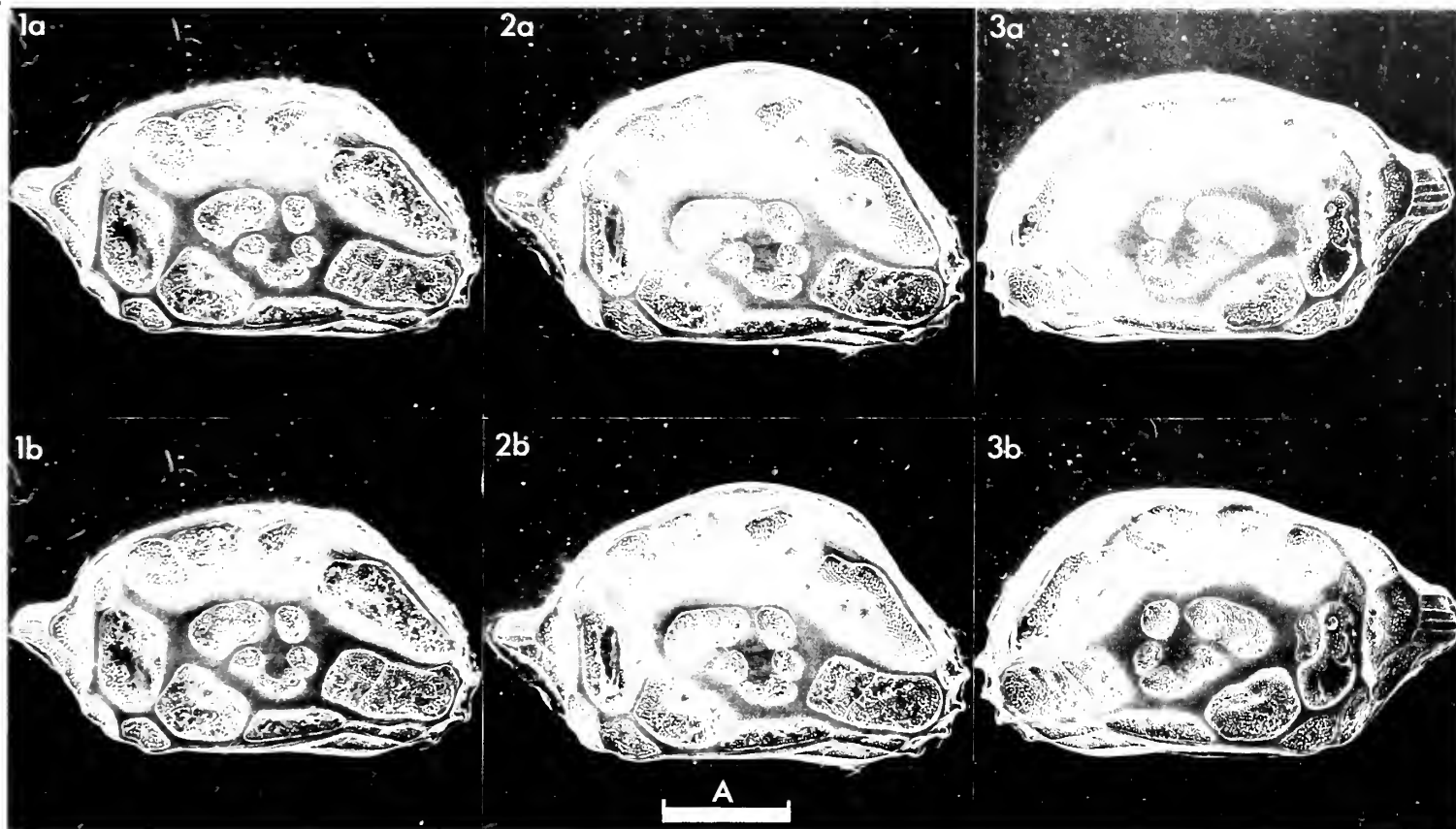
Text-figs. 2 - 5. *Hemicytherura videns* (Müller). ♂ copulatory appendages. 2, Salerno, Italy (1980.340). 3, Amathus, Cyprus (1980.341). 4, Kelibia, Tunisia (1980.342). 5, Tenerife, Canary Islands (1980.343).

Dissections and drawings by D. Horne.

Explanation of Plate 8, 26

Fig. 1, ♂ RV, ext. lat. (1980.337, 320 μm long); fig. 2, ♀ RV, ext. lat. (neotype, 1980.338, 350 μm long); fig. 3, ♀ RV, ext. lat. (1980.339, 350 μm long).

Scale A (100 μm; x 172), figs. 1 - 3.



ON HEMICYTHERE VILLOSA (SARS)

by John Athersuch & John E. Whittaker
(B.P. Research Centre, Sunbury and British Museum (Natural History), London)

Genus *Hemicythere* Sars, 1925

Type-species (designated by Edwards, 1944): *Cythereis villosa* Sars, 1866.

1928 *Auris (pars)*, A. Neviani, *Memorie Accad. pont. Nuovi Lincei*, ser. 2, **11**, 72 (junior homonym of *Auris* Klein, 1753, Mollusca).

1940 *Eucythereis (pars)*, W. Klie, *Kieler Meeresforsch.*, **3**, 416.

Diagnosis: Carapace subquadrate, inflated; surface pitted or reticulate. Radial pore canals straight and numerous. Two frontal muscle scars, adductor scars in vertical row of four with upper, and sometimes lower, of middle two subdivided. Hinge with elongate, lobate, posterior tooth/socket, crenulate median element and dorsally elongate anterior tooth/socket.

Hemicythere villosa (Sars, 1866)

1866 *Cythereis villosa* sp. nov. G. O. Sars, *Forh. VidenskSelsk. Krist.*, **1865**, 42.

1868 *Cythere villosa* (Sars); G. S. Brady, *Trans. Linn. Soc. Lond.*, **26**, 411, pl. 29, figs. 28 - 32.

1925 *Hemicythere villosa* (Sars); G. O. Sars, *An account of the Crustacea of Norway*, vol. 9, *Ostracoda*, Bergen Museum, parts 11, 12, 182, pl. 84.

1941 *Cythereis (Eucythereis) villosa* Sars; O. Elofson, *Zool. Bidr. Upps.*, **19**, 287.

1957 *Eucythereis villosa* (Sars); A.P.C. de Vos, *Arch. Zool. exp. gen.*, **95**, 32, pl. 14, figs. 1a - f.

non 1963 *Hemicythere villosa* (Sars); F. Swain, *J. Paleont.*, **37**, 828, pl. 99, figs. 4, 6; text-fig. 10c.

1978 *Hemicythere arborescens* (Brady); E. Robinson, in R. H. Bate & E. Robinson, *A Stratigraphic Index of British Ostracoda*, *Geol. J.*, Special Issue 8, 462, pl. 3, figs. 3a, b. (non *Cythere arborescens* Brady, 1865 = *nomen dubium*; see Remarks, below).

Explanation of Plate 8, 28

Fig. 1, ♂ LV, ext. lat. (1980.422; 690 µm long); fig. 2, ♀ RV, ext. lat. (1980.423; 730 µm long); fig. 3, ♀ car., lt. lat. (1980.424; 750 µm long).

Scale A (250 µm; x 80), figs. 1 - 3.

Type specimens: The types of *H. villosa* are not amongst the Sars' Collection at Oslo University and are presumed lost. However, the descriptions and illustrations of Sars (1866, 1925) adequately define this species and it is not considered necessary to designate a neotype.

Type locality: Christianafjord (Oslofjord), S Norway; Recent.

Figured specimens: Brit. Mus. (Nat. Hist.) nos. **1980.422** (♂ LV and soft-parts: Pl. 8, 28, fig. 1; text-fig. 4), **1980.423** (♀ RV: Pl. 8, 28, fig. 2), **1980.424** (♀ car.: Pl. 8, 28, fig. 3), **1980.425** (♀ car.: Pl. 8, 30, fig. 1), **1980.426** (♀ RV: Pl. 8, 30, fig. 3), **1980.427** (♂ soft-parts: text-figs. 1 - 3), **OS 9162** (♀ RV: Pl. 8, 30, fig. 2).

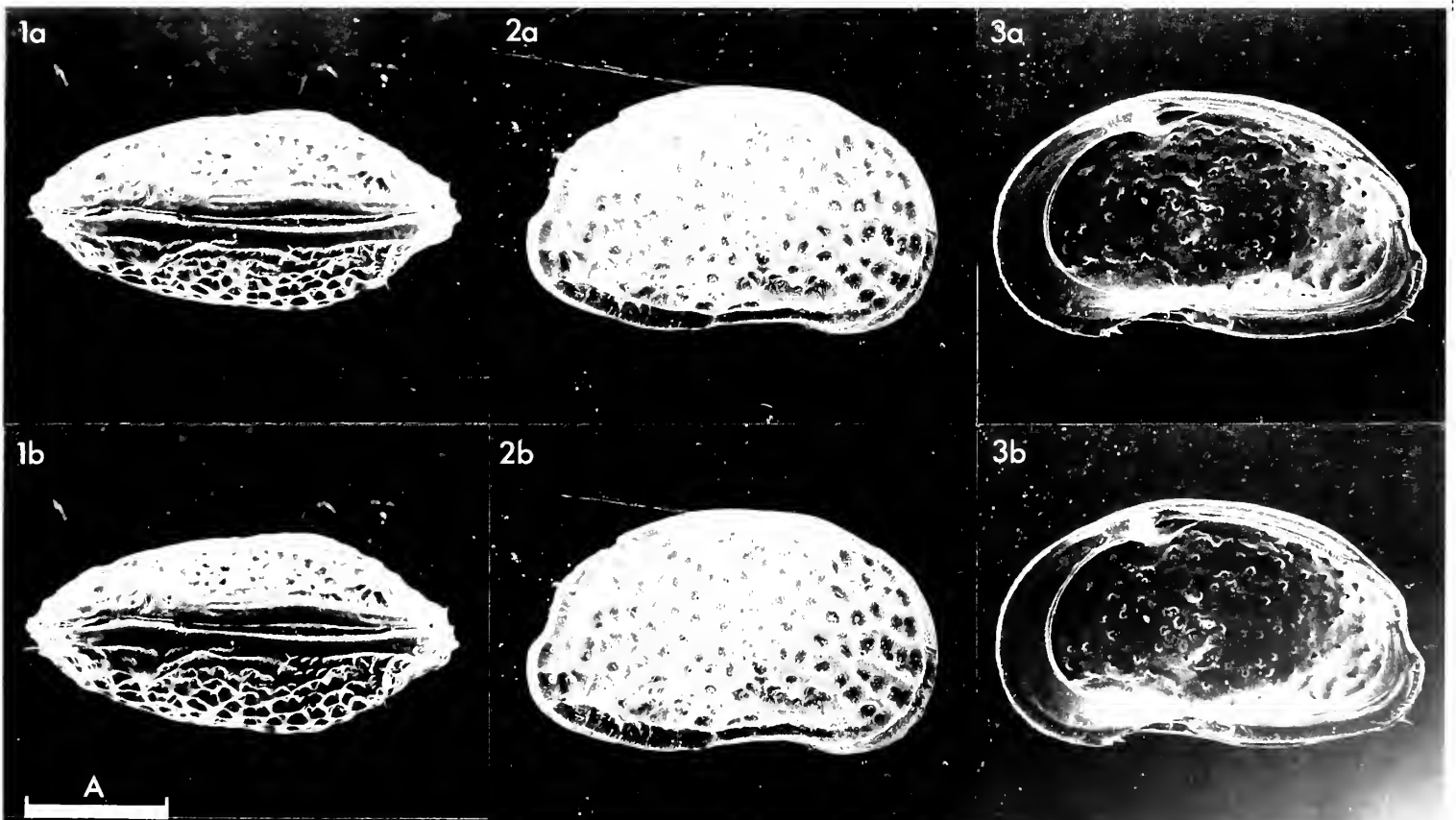
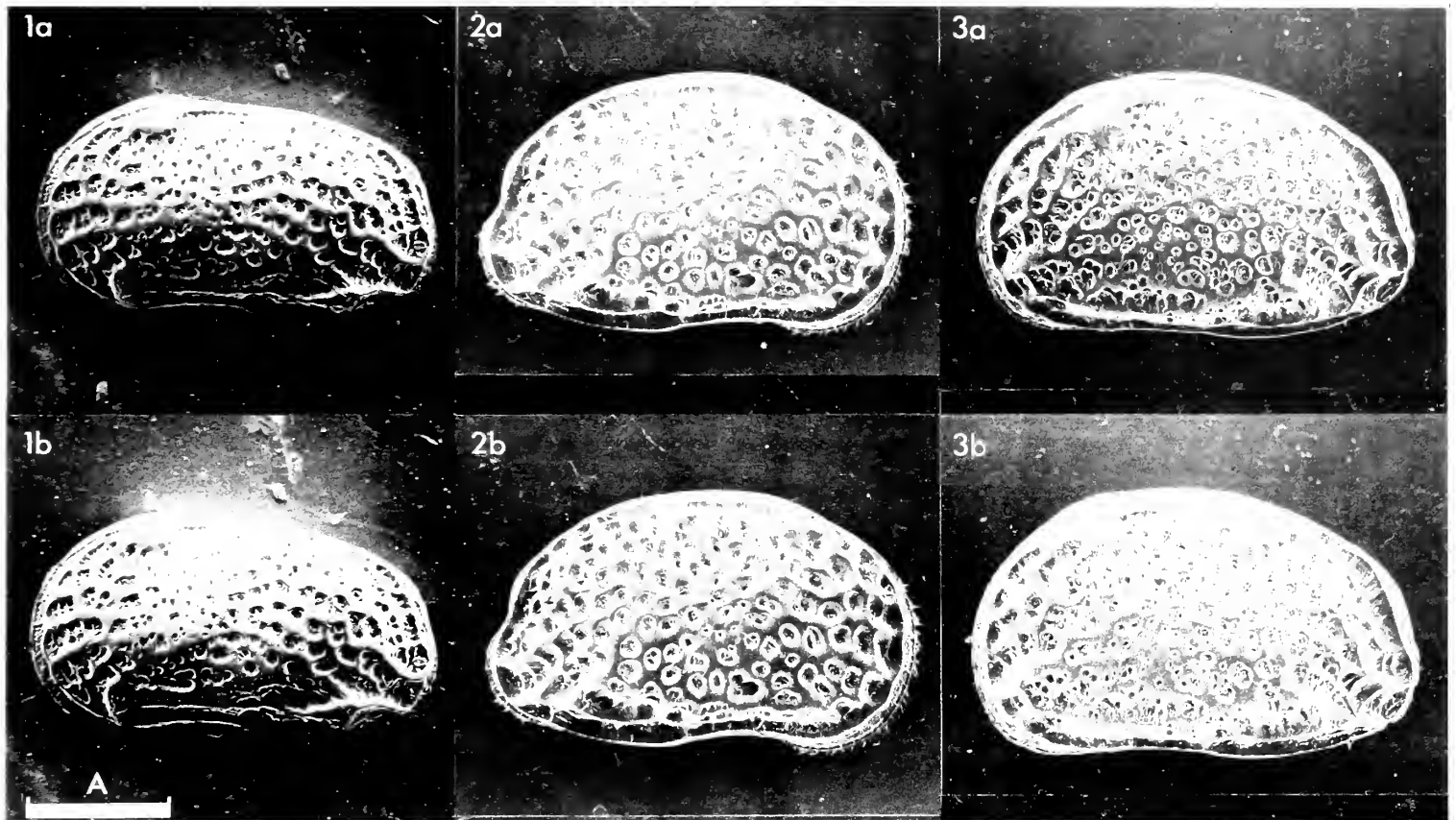
1980.422 from Bass Rock, Firth of Forth, E Scotland, approx. lat. 56° 05' N, long. 02° 38' W, ex T. Scott Coll., collected 1893. **1980.423** was collected from *Fucus vesiculosus* with epiphytes, 29th May 1968 (salinity 33.2‰, temp. 19°C) and **1980.424 - 426** from the holdfasts of *Laminaria saccharina* 26th May 1969 (salinity 31.4‰, temp. 13°C), both on the Fleet, Dorset, S England, approx. lat. 50° 36' N, long. 02° 30' W, collected by J. E. Whittaker. **1980.427** was collected by J. Athersuch from mixed intertidal algae, at Robin Hood's Bay, N E England, approx. lat. 54° 26' N, long. 00° 32' W, 22nd September 1979. **OS 9162**, from the Nar Valley Clay, Norfolk, E England, approx. lat. 52° 43' N, long. 00° 31' E, is Hoxnian in age and was collected by J. E. Robinson.

Diagnosis: Carapace surface covered with large subrounded fossae or clusters of small pits; tendency to become reticulate anteriorly and posteriorly. In female, posteroventral fossae form depressed groups; postero-dorsal protuberance developed. In male, posteroventral fossae not depressed; posteroventral protuberance developed. Strong, smooth dorsal margin. Seen dorsally, tapering anteriorly for two-thirds of length; rounded anteriorly, more truncate posteriorly. Female slightly longer, but proportionately much higher than male. Copulatory appendage with large distinctive lappet and long *ductus ejaculatorius*.

Explanation of Plate 8, 30

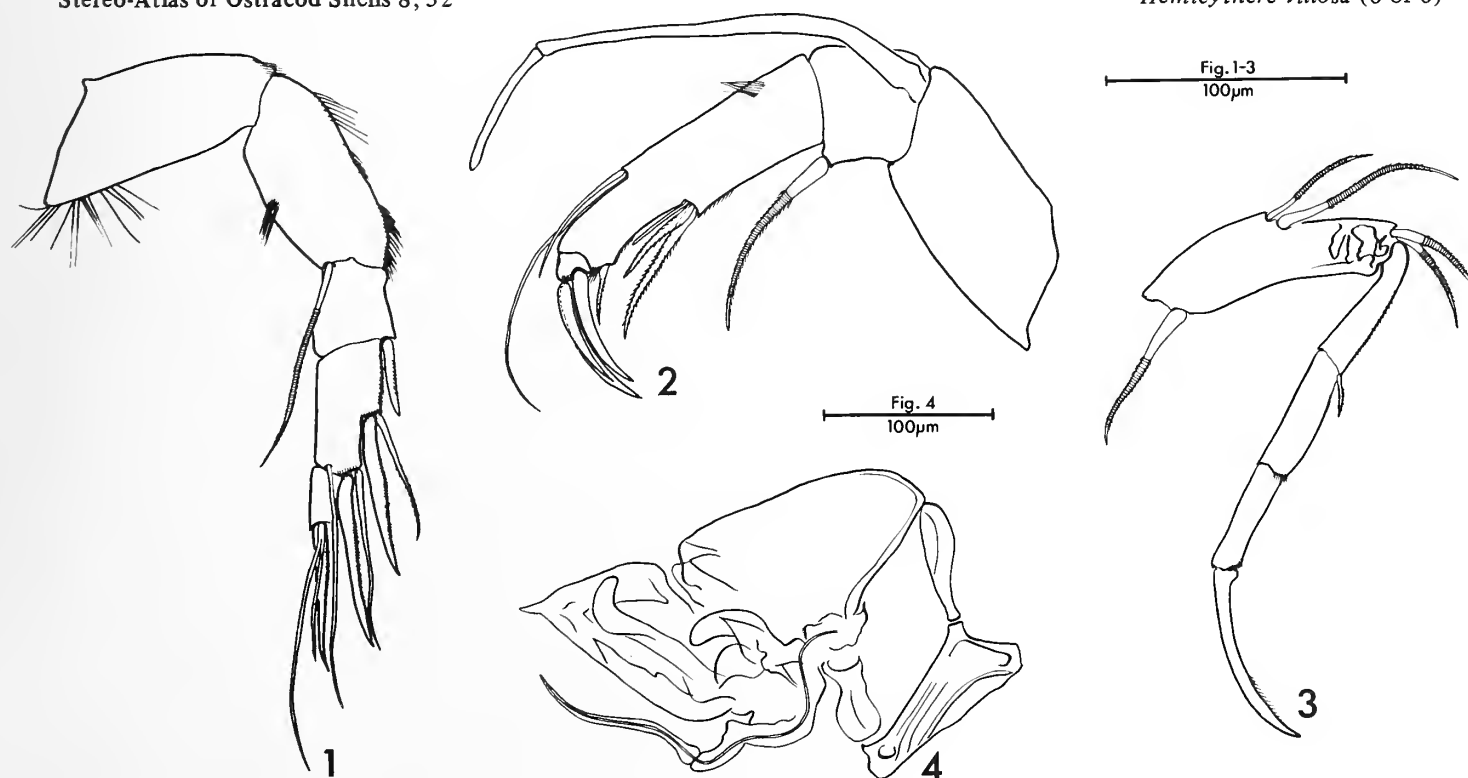
Fig. 1, ♀ car., ext. dors. (1980.425; 750 µm long); fig. 2, ♀ RV, ext. lat. (OS 9162; 710 µm long); fig. 3, ♀ RV, int. lat. (1980.426; 740 µm long).

Scale A (250 µm; x 80), figs. 1 - 3.



Remarks: We consider that the specimens illustrated by Robinson (1978) under the name *Hemicythere arborescens* (Brady, 1865) are conspecific with *H. villosa* (Sars). The true identity of *H. arborescens* is not known since the type specimens from the Hoxnian Brickearth of the Nar Valley, Norfolk, are not in Brady's collections either at the Hancock Museum, Newcastle-upon-Tyne, or the Brit. Mus. (Nat. Hist.), and are presumed lost. Brady's (*Ann. Mag. nat. Hist.*, ser. 3, 16, 190, pl. 9, figs. 5 - 8, 1865) original illustrations are somewhat confusing in that they could represent any one of a number of species including *H. villosa* and *Aurila convexa* (Baird, 1850). In fact it was the latter which Brady himself (1868, *op. cit.*, 401) considered to be a senior synonym of *Cythere arborescens*. Consequently, we prefer to regard this name as a *nomen dubium* until it can be assigned to a definite taxon. This may be possible when the current re-investigation of the Nar Valley ostracod faunas by E. Robinson (pers. comm.) is completed.

Distribution: Recent: coasts of Britain and N Europe associated with littoral, marine algae and sediment; sub-Recent: Holland (Wagner, *Sur les Ostracodes du Quaternaire recent des Pays-Bas* . . . , Mouton & Co., The Hague, 56, 1957); Hoxnian (as *H. arborescens*(Brady)), Nar Valley Clay, Norfolk and Slindon Sands, Sussex, England (Robinson, *op. cit.*).



Text-figs. 1 - 4. Appendages of *Hemicythere villosa*. 1, ♂ first antenna; 2, ♂, second antenna; 3, ♂ first leg (all 1980.427); 4, ♂ copulatory appendage (1980.422).

ON *CYTHEROPTERON ELOFSONI* LORD sp. nov.

by Alan Lord
(University College, London)

Cytheropteron elofsoni sp. nov.

Holotype: Brit. Mus. (Nat. Hist.) OS 7688, RV.

[*Paratypes*: Brit. Mus. (Nat. Hist.) OS 7689, OS 7690].

Type locality: Sample depth 8.00 - 8.05m, Brastad Borehole, NE, of Lyskil, SW Sweden; lat. 58° 22' 50" N, long. 11° 33' 01" E. Late Weichselian, Pleistocene.

Derivation of name: In honour of Dr. Olof Elofson, the distinguished student of Swedish Ostracoda.

Figured specimens: Brit. Mus. (Nat. Hist.) nos. OS 7688 (holotype, RV: Pl. 8, 34, fig. 1; Pl. 8, 36, figs. 1, 2, 3, 5), OS 7689 (RV: Pl. 8, 34, fig. 3; Pl. 8, 36, fig. 6), OS 7690 (RV: Pl. 8, 34, fig. 2; Pl. 8, 36, fig. 4). All specimens from type locality and horizon.

Explanation of Plate 8, 34

Fig. 1, RV, ext. lat. (holotype, OS 7688, 706 μ m long); fig. 2, RV, int. lat. (paratype, OS 7690, 470 μ m long); fig. 3, RV, ext. lat. (paratype, OS 7689, 575 μ m long).

Scale A (100 μ m; x 95), fig. 1; scale B (100 μ m; x 110), fig. 2; scale C (100 μ m; x 135), fig. 3.

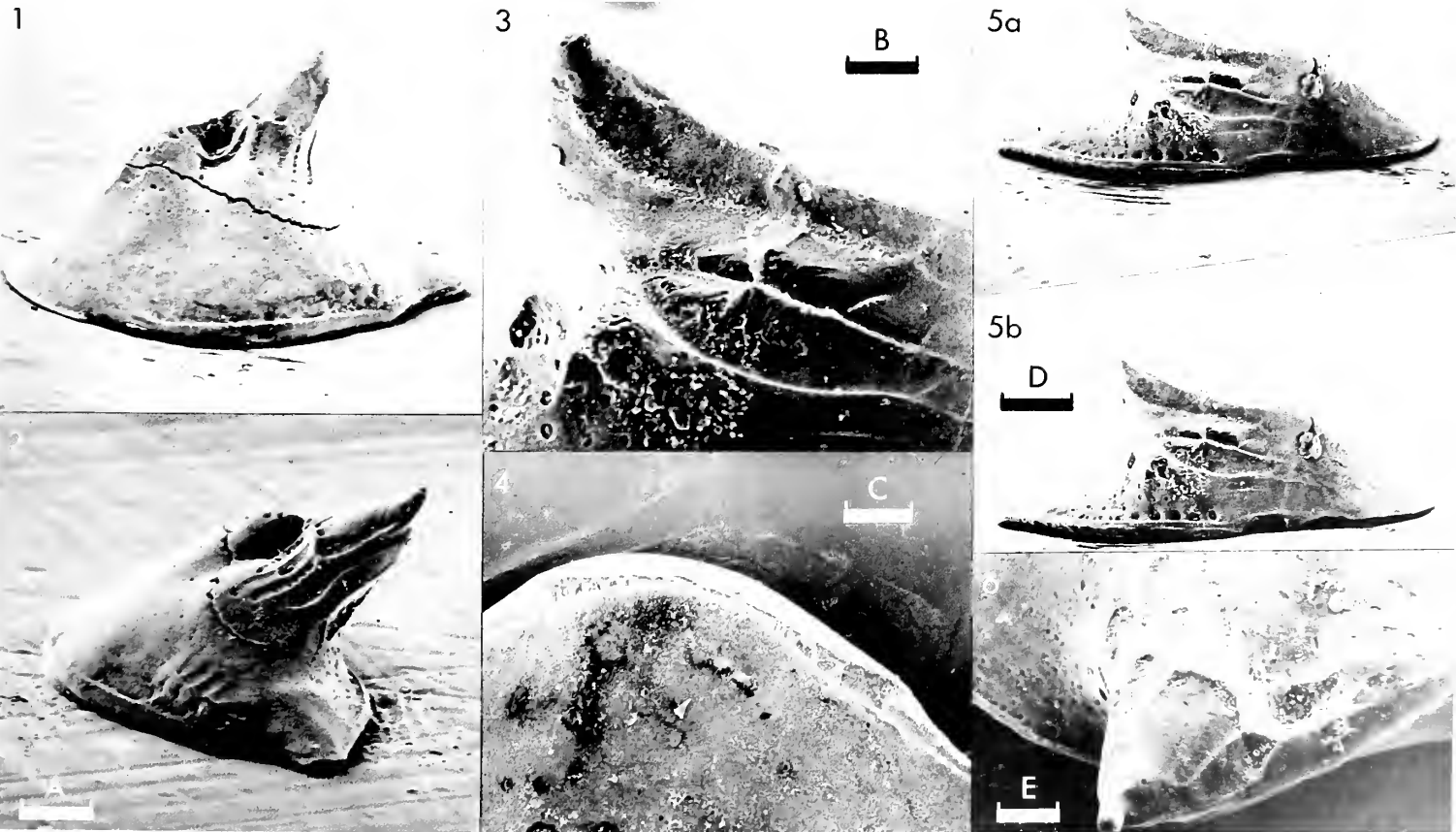
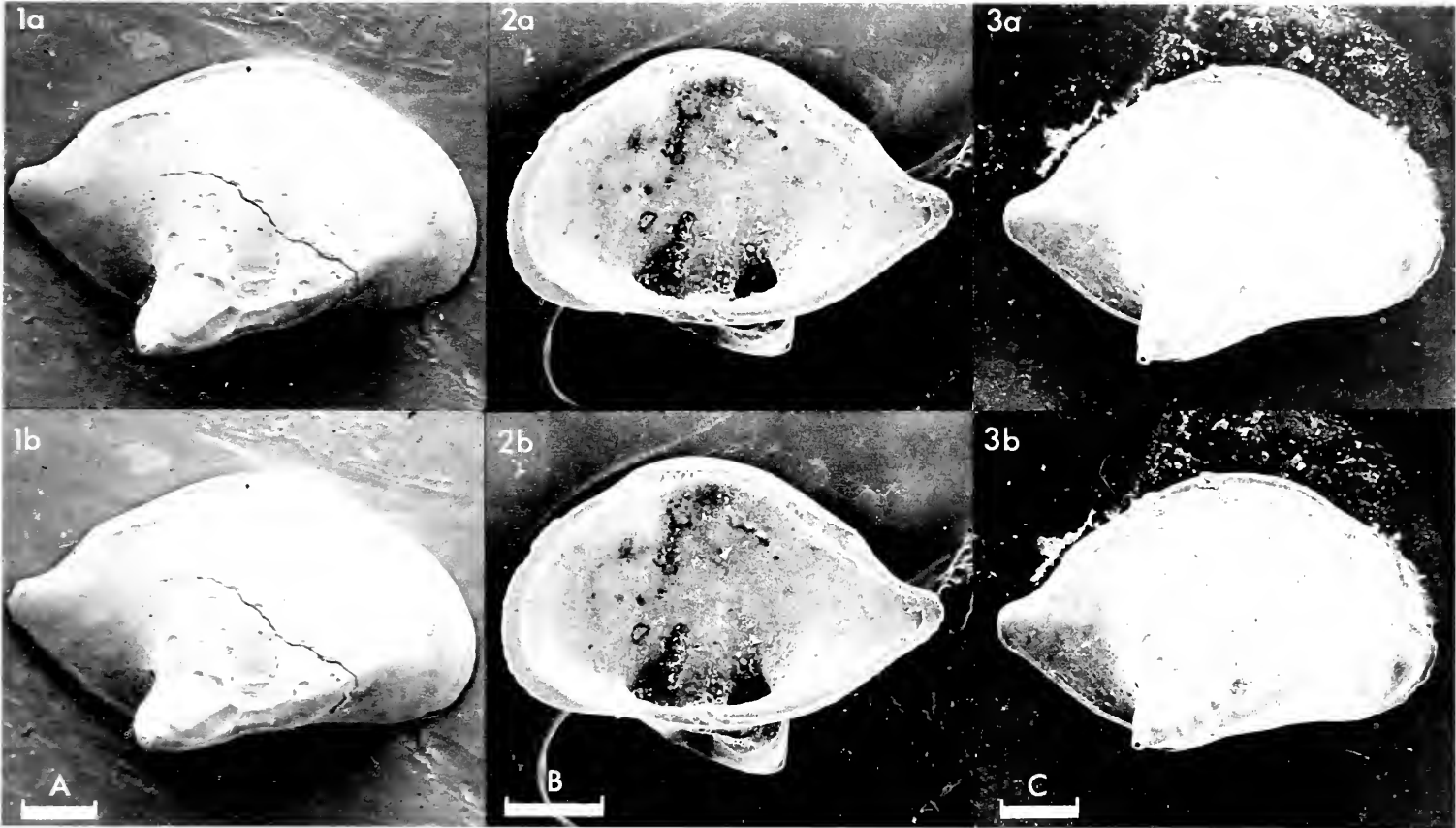
Diagnosis: Species of *Cytheropteron* with distinctive combination of smooth lateral valve surface and a strongly protuberant grooved and ridged spine.

Remarks: Similar shape to *C. crassipinnatum* Brady & Norman, (*Scient. Trans. R. Dubl. Soc.*, ser. 2, 4, 212, 1889) but that species has surface ornament and different spine morphology. *C. pipistrella* Brady, (*Trans. zool. Soc. Lond.*, 10, 8/1, 404, 1878) also has similar valve outline but differs in spine morphology and orientation. Another species with comparable outline is *C. sedovi* Schneider, as illustrated by Lev (*Uchen. Zap. nauchno-issled. Inst. Geol. Arkt., Paleont. Biostrat.*, 28, Pl. 1, fig. 7, 1969) and (?) by Whatley & Masson (*Revta esp. Micropaleont.* 11, 251 and Pl. 7, figs. 15 - 19, 1979), the latter material has a strong reticulate ornament. *Cytheropteron elofsoni* occurs with *Eucytheridea punctillata* (Brady) *Normanicythere leioderma* (Norman), *Acanthocythereis dunelmensis* (Norman), *Palmenella limicola* (Norman), and *C. nodosoalatum* Neale & Howe in cool, probably shallow water assemblages. Probably extinct.

Explanation of Plate 8, 36

Fig. 1, RV, ext. dors. (holotype, OS 7688, 706 μ m long); fig. 2, RV, posterodors. obl. (holotype, OS 7688, 706 μ m long); fig. 3, RV, spine vent. detail (holotype, OS 7688, 706 μ m long); fig. 4, RV, int. lat. hinge detail (paratype, OS 7690, 470 μ m long); fig. 5, RV, ext. vent. (holotype, OS 7688, 706 μ m long); fig. 6, RV, ext. lat. detail (paratype, OS 7689, 575 μ m long).

Scale A (100 μ m; x 95), figs. 1, 2; Scale B (40 μ m; x 250), fig. 3; Scale C (200 μ m; x 210), fig. 4; Scale D (100 μ m; x 95), fig. 5; Scale E (40 μ m; x 300), fig. 6.



ON *CYTHEROPTERON BRASTADENSIS* LORD sp. nov.

by Alan Lord
(University College, London)

Cytheropteron brastadensis sp. nov.

Holotype: Brit. Mus. (Nat. Hist.) OS 7685 LV.
[Paratypes: Brit. Mus. (Nat. Hist.) OS 7686, OS 7687].

Type locality: Sample depth 6.50 - 6.55m, Brastad Borehole, N E, of Lysekil, S W Sweden; lat. 58° 22' 50" N, long. 11° 33' 01" E. Late Weichselian, Pleistocene.

Derivation of name: In reference to the type locality.

Figured specimens: Brit. Mus. (Nat. Hist.) OS 7685 (holotype, LV: Pl. 8, 38, figs. 1, 2; Pl. 8, 40, figs. 3 - 7), OS 7686 (RV: Pl. 8, 38, fig. 3; Pl. 8, 40, fig. 1), OS 7687 (RV: Pl. 8, 40, fig. 2). All specimens from type locality and horizon.

Diagnosis: A species of *Cytheropteron* with a blade-like alate extension, a posterodorsal ridge and partial punctation of lateral surface; posteroventral margin complexly ornamented.

Explanation of Plate 8, 38

Fig. 1, LV, ext. lat. (holotype, OS 7685, 512 μ m long); fig. 2, LV, int. lat. (holotype, OS 7685, 512 μ m long); fig. 3, RV, ext. lat. (paratype, OS 7686, 531 μ m long).

Scale A (100 μ m; x 120), figs. 1 - 3.

Remarks: Similar in shape to *C. biconvexa* Whatley and Masson (*Revta esp. Micropaleont*, 11, 229, 1979) from the Pleistocene of the North Sea, but larger and differs in surface ornament and hingement. Also comparable with the recent *C. hadriaticum* Bonaduce, Ciampo and Masoli (*Pubbl. Staz. zool. Napoli*, 40 suppl., 93, 1975) from the Adriatic Sea, but larger, less uniformly punctate on lateral surfaces and differs in hingement. The Recent form *C. excisum* Bonaduce, Masoli and Pugliese (*Pubbl. Staz. zool. Napoli*, 40, 21 1976) from the Gulf of Aqaba differs markedly in shape posteriorly, but is poorly known.

Hinge a form of antimerodont structure with (RV) an anterior bifid tooth, an arched (?) locellate median element with a straight locellate posterior part and 3 posterior teeth. Complex punctation with intervening ridges in posteroventral region (Pl. 8, 40, figs. 6, 7). Probably extinct; occurs in similarly structured species associations as *C. elofsoni* (*Stereo-Atlas of Ostracod Shells*, 8, 33 - 36, 1981).

Text - fig. 1
muscle scars of
c. brastadensis
sp. nov. (x500).

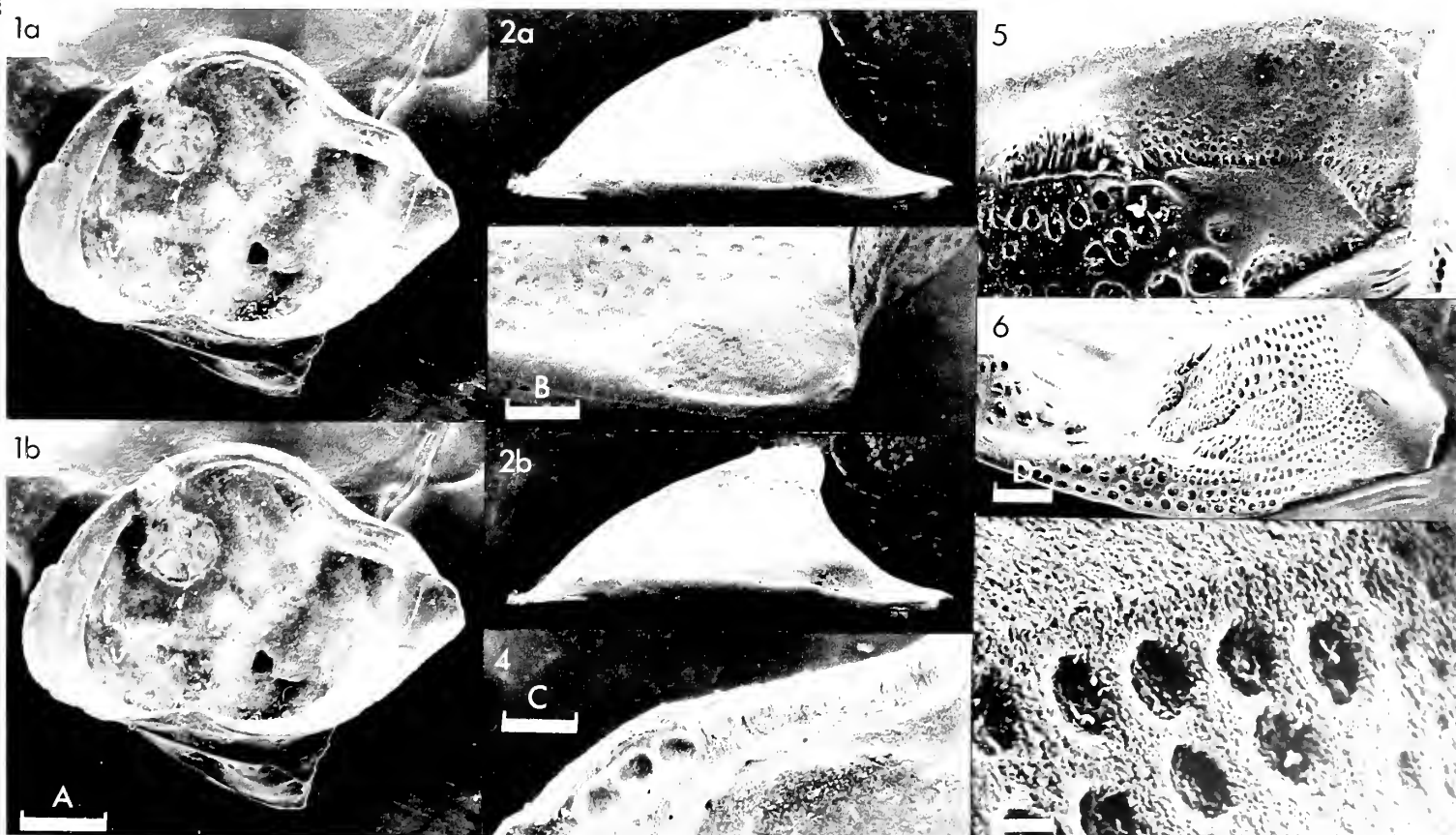
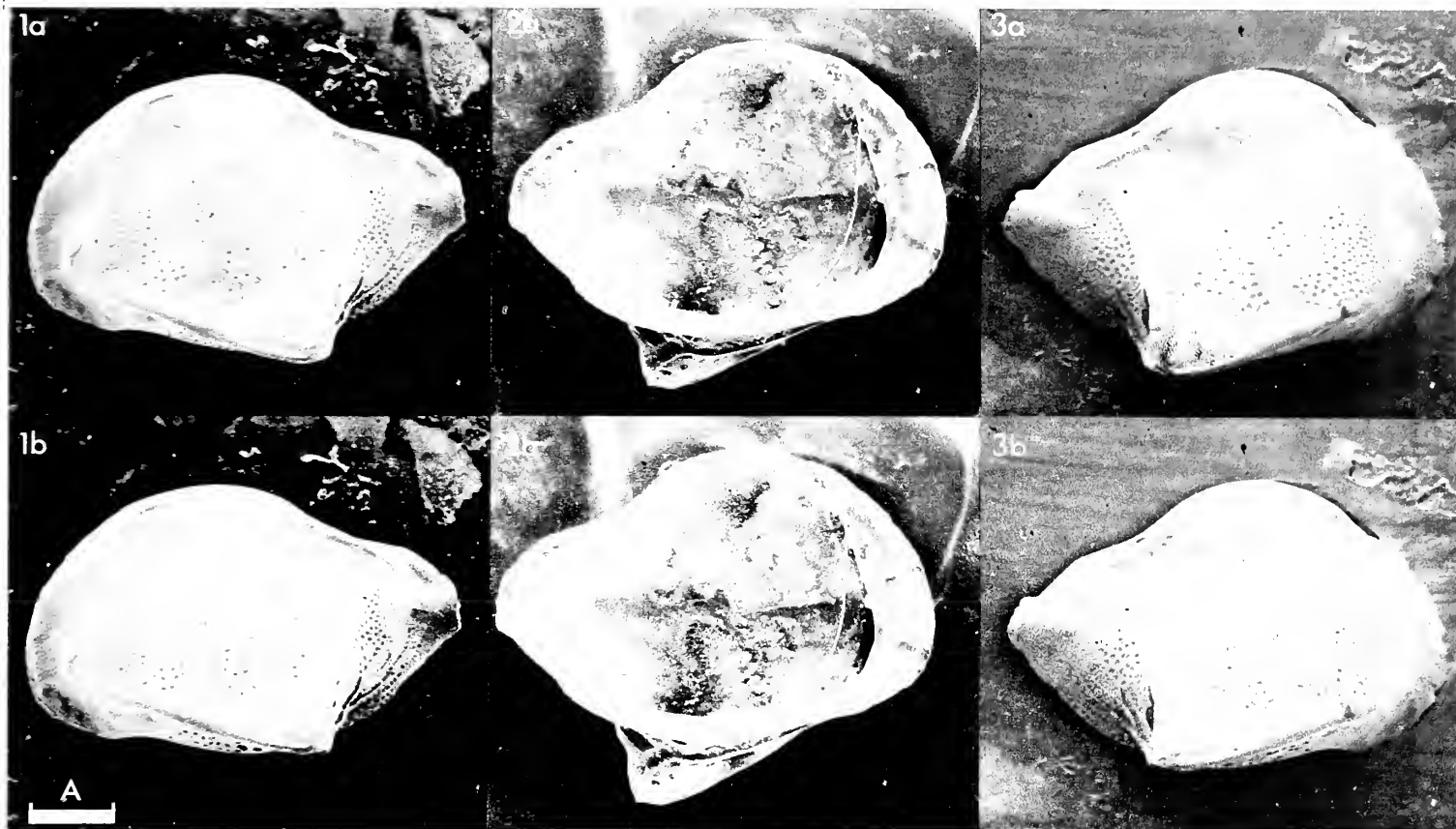
A. LV (from Pl. 8, 38, fig. 2)
(Holotype, OS 7685).

B. RV (from Pl. 8, 40, fig. 1) (OS 7686).

Explanation of Plate 8, 40

Fig. 1, RV, int. lat. (paratype, OS 7686, 531 μ m long); fig. 2, RV, ext. dors. (paratype, OS 7687, 525 μ m long); figs. 3 - 7, LV, (holotype, OS 7685, 512 μ m long): fig. 3, ext. lat. detail; fig. 4, post. hinge detail; fig. 5, vent. detail; fig. 6, posterovent. obl.; fig. 7, detail of upper right area of fig. 6.

Scale A (100 μ m; x 120), figs. 1, 2; scale B (40 μ m; x 260), fig. 3; scale C (25 μ m; x 400), figs. 4, 5; scale D (40 μ m; x 200), fig. 6; scale E (4 μ m; x 2000), fig. 7.



ON *KINKELINELLA MALZI* (DÉPÊCHE)by Lesley M. Sheppard
(British Museum (Natural History) London)*Kinkelinella malzi* (Dépêche, 1973)1973 *Glyptocythere* ? *malzi* F. Dépêche, *Rev. Micropaléont.*, 15, 4, 222, pl. 2, figs. 9 - 13.*Holotype*: University of Paris no. FD 029.*Type locality*: Marnes de Port-en-Bessin, Port-en-Bessin, Normandy; L Bathonian.*Figured specimens*: Brit. Mus. (Nat. Hist.) nos. OS 11483 (♀ LV: Pl. 8, 42, fig. 2), OS 11811 (♂ LV: Pl. 8, 42, fig. 1), OS 11812 (♀ LV: Pl. 8, 44, fig. 1), OS 11813 (juv. LV: Pl. 8, 44, fig. 3), OS 11814 (♂ car.: Pl. 8, 44, fig. 2), OS 11815 (♀ RV: Pl. 8, 42, fig. 3). All specimens are from the L Bathonian at the type locality.*Diagnosis*: Species of *Kinkelinella* with alate ventrolateral extension of valves and coarse reticulate ornamentation produced by dorsoventral trending ridges and grooves. Shallow subcentral sulcus situated in front of ala. Smooth eye node.

Explanation of Plate 8, 42

Fig. 1, ♂ LV, ext. lat. (OS 11811, 520 µm long); fig. 2, ♀ LV, ext. lat. (OS 11483, 530 µm long); fig. 3, ♀ RV, ext. lat. (OS 11814, 370 µm long).

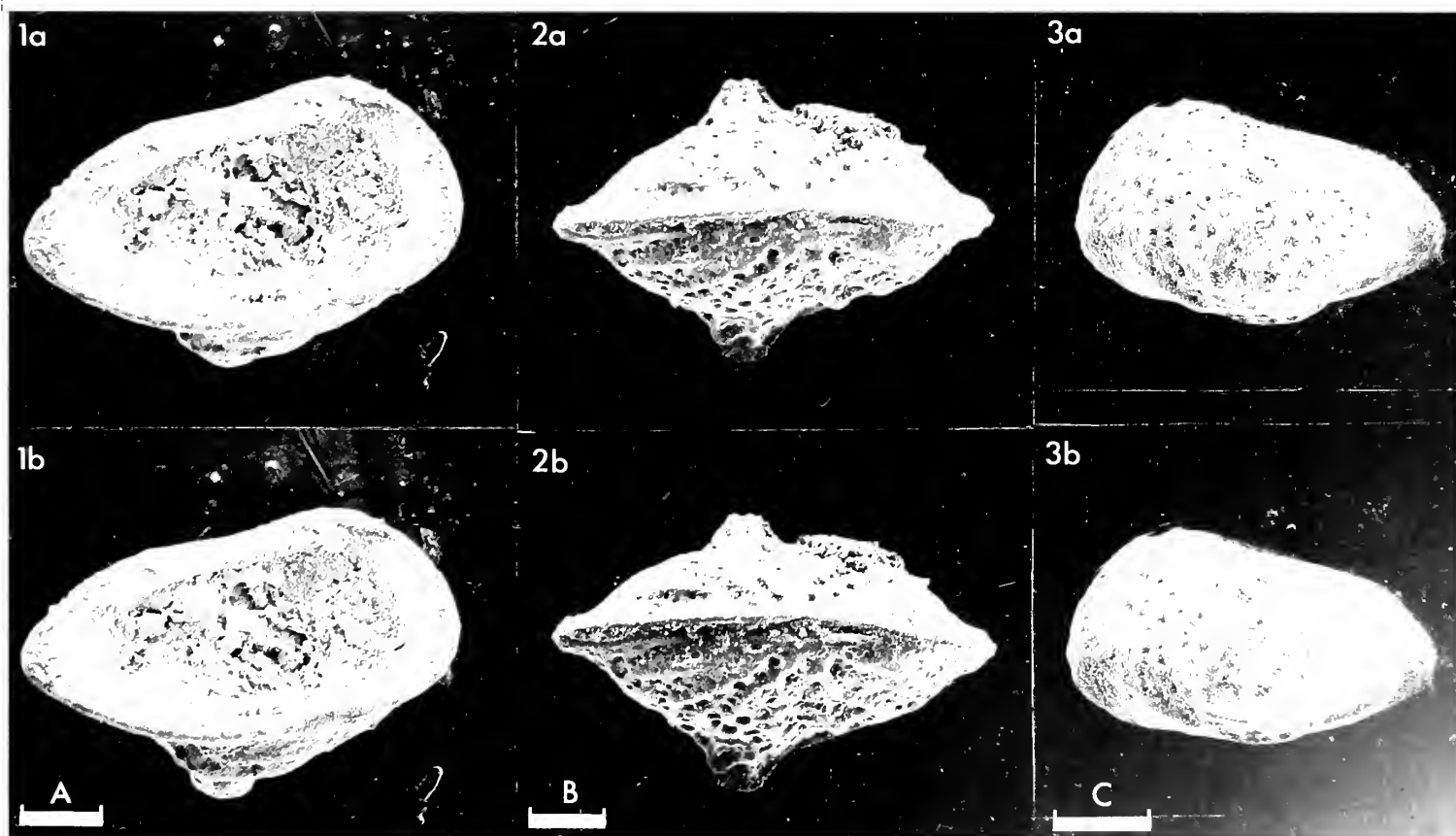
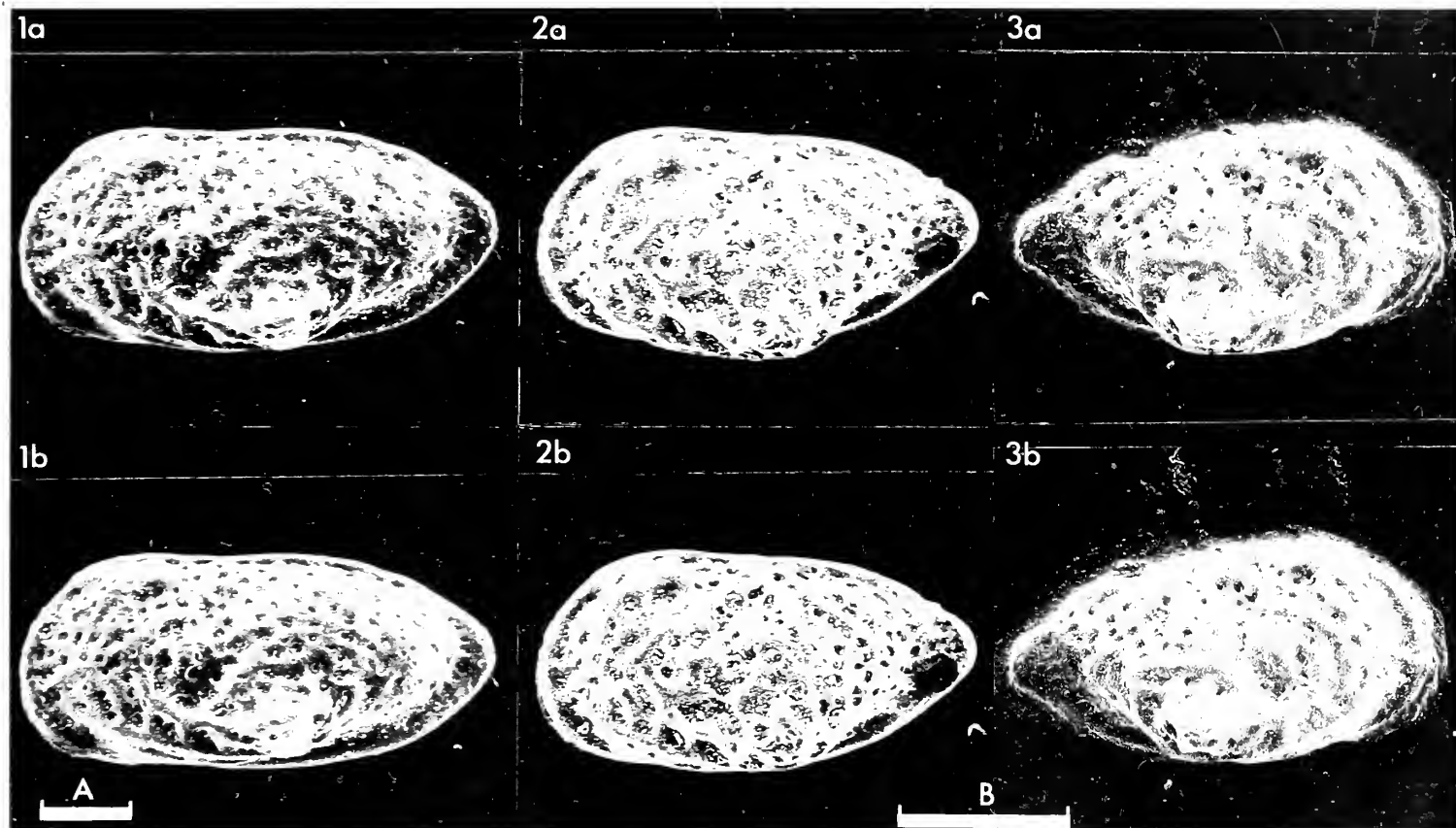
Scale A (100 µm; x 125), fig. 1; scale B (200 µm; x 115), figs. 2, 3.

Remarks: *Kinkelinella* and *Ektyphocythere* represent two morphological groups with strikingly different ornamental patterns which Bate & Coleman (*Bull. Geol. Surv. G.B.*, 55, 14, 1975) consider are congeneric but that each group is developed to such an extent that a subgeneric category is required for each one (*Kinkelinella* having an ornamentation of dorsoventral trending elements and *Ektyphocythere* with a triangular ornamentation dominating). I would go one step further and suggest that the differences in ornamentation (or more correctly in sculpture when dealing with a higher order of importance than purely specific) are sufficient to distinguish the two as separate genera. As a genus, *Kinkelinella* is known from the Toarcian, Aalenian and Bajocian of Europe (Malz, *Senck. leth.*, 47, 4, 385 - 404, 1966); *K. malzi* thus represents the youngest record of the genus.Although the muscle scars have not been observed in this species it is here assigned to *Kinkelinella* on the strength of the ventrolateral overhang of the valves, the compressed anterior and posterior marginal borders, the simple, straight marginal pore canals, the antimerodont hinge and presence of an eye node.The alate extensions of the valves in *K. malzi* are more pronounced than in any other species of the genus and associated with these are subcentral sulci which are not seen in other species. The well developed alae may simply be morphological adaptations which evolved as a result of inhabiting a muddy sea floor type of environment in which it was advantageous to increase the surface area/volume ratio of the carapace to prevent sinking. Such an environment was common in the L Jurassic (Lord, *Bull. geol. Soc. Denm.*, 21, 319 - 336, 1972) and also in the lowermost Bathonian.*Distribution*: Known from the L Bathonian of Normandy and the L Bathonian, L Fuller's Earth of Dorset.

Explanation of Plate 8, 44

Fig. 1, ♀ LV, int. lat. (OS 11812, 510 µm long); fig. 2, ♂ car., ext. dors. (OS 11814, 570 µm long); fig. 3, juv. LV, ext. lat. (OS 11813, 370 µm long).

Scale A (100 µm; x 117), fig. 1; scale B (100 µm; x 105), fig. 2; scale C (100 µm; x 135), fig. 3.



ON *PARALIMNOCY THERE VULGARIS* McKENZIE & SWANSON sp. nov.

by Kenneth McKenzie & Kerry Swanson
(Riverina College of Advanced Education, Australia,
and University of Canterbury, New Zealand)

Paralimnocythere vulgaris sp. nov.

Holotype: New Zealand Geological Survey no. TO 1135.1, car.

[Paratypes: N.Z. Geological Survey nos. TO 1135.2 – 15. Figured soft parts: Univ. of Canterbury Geol. Dept. no. UCF 1271].

Type locality: Limestone pit, southeastern end of the Crown Terrace. Kawarau Gorge, South Island, New Zealand; lat. 45° 00' S, long. 168° 54' E. N.Z. Geol. Surv. Fossil Record No. L41/f 147. Late Quaternary lacustrine silts, sandy silts and limestones.

Derivation of name: The most common species in the Kawarau Gorge sequence.

Explanation of Plate 8, 46

Fig. 1, RV, int. lat. (paratype, TO 1135.2, 460 µm long); fig. 2, car. dors. (paratype, TO 1135.4, 470 µm long).
Scale A (200 µm; x 200), fig. 1; scale B (200 µm; x 170).

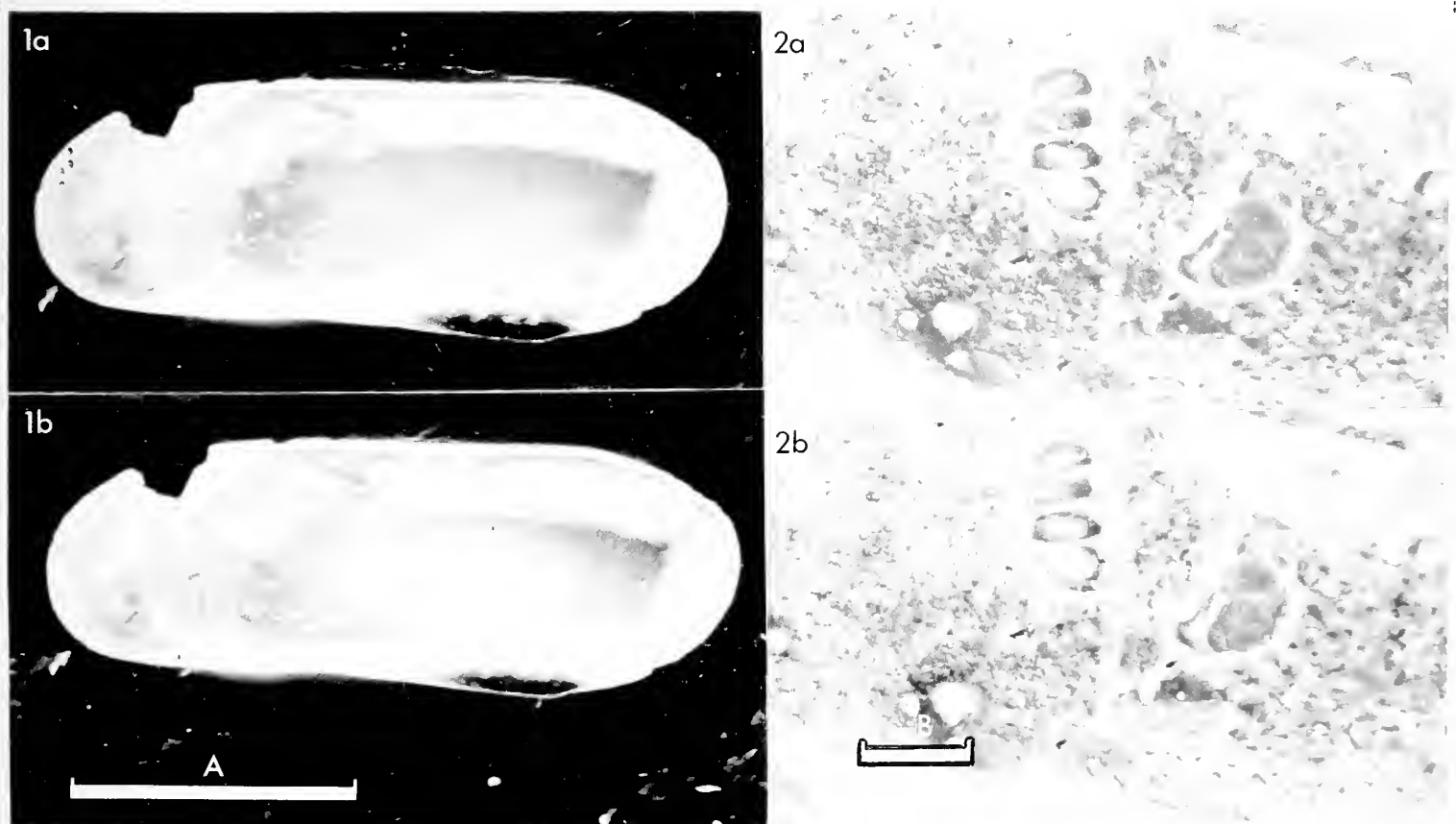
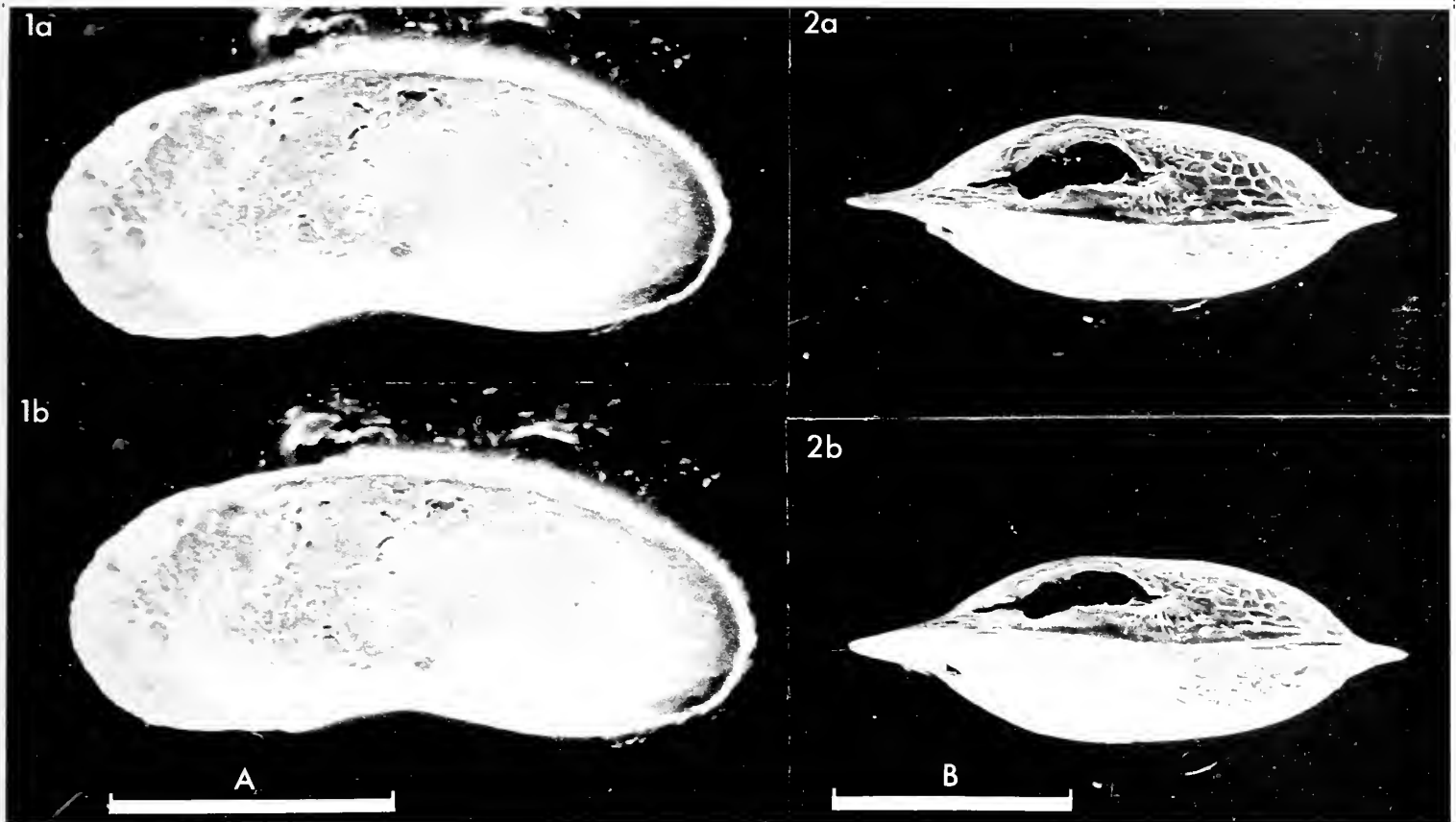
Figured specimens: N.Z. Geol. Surv. nos. TO 11352.2 (car.: Pl. 8, 46, fig. 1), TO 1135.3 (car.: Pl. 8, 48, fig. 2), TO 1135.4 (car.: Pl. 8, 46, fig. 2), TO 1135.5 (car.: Pl. 8, 48, fig. 1). From Crown Terrace, Kawarau Gorge, South Island, New Zealand. UCF. 1271 (ovig. appendages: text-figs. 1 - 2). Dip net sample. From small temporary pond near Lake Tekapo, South Island, New Zealand; lat. 43° 54' S, long. 170° 35' E.

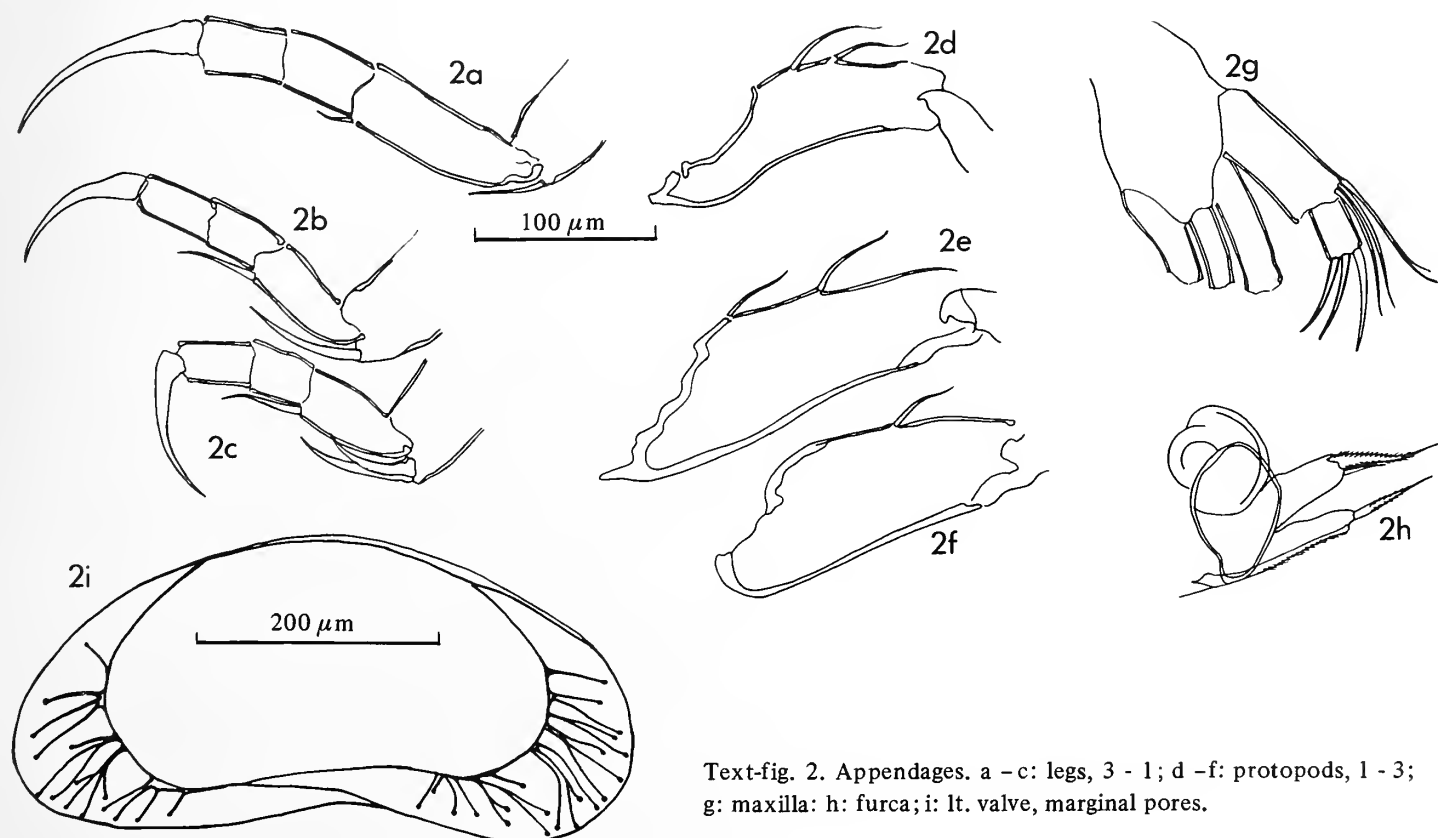
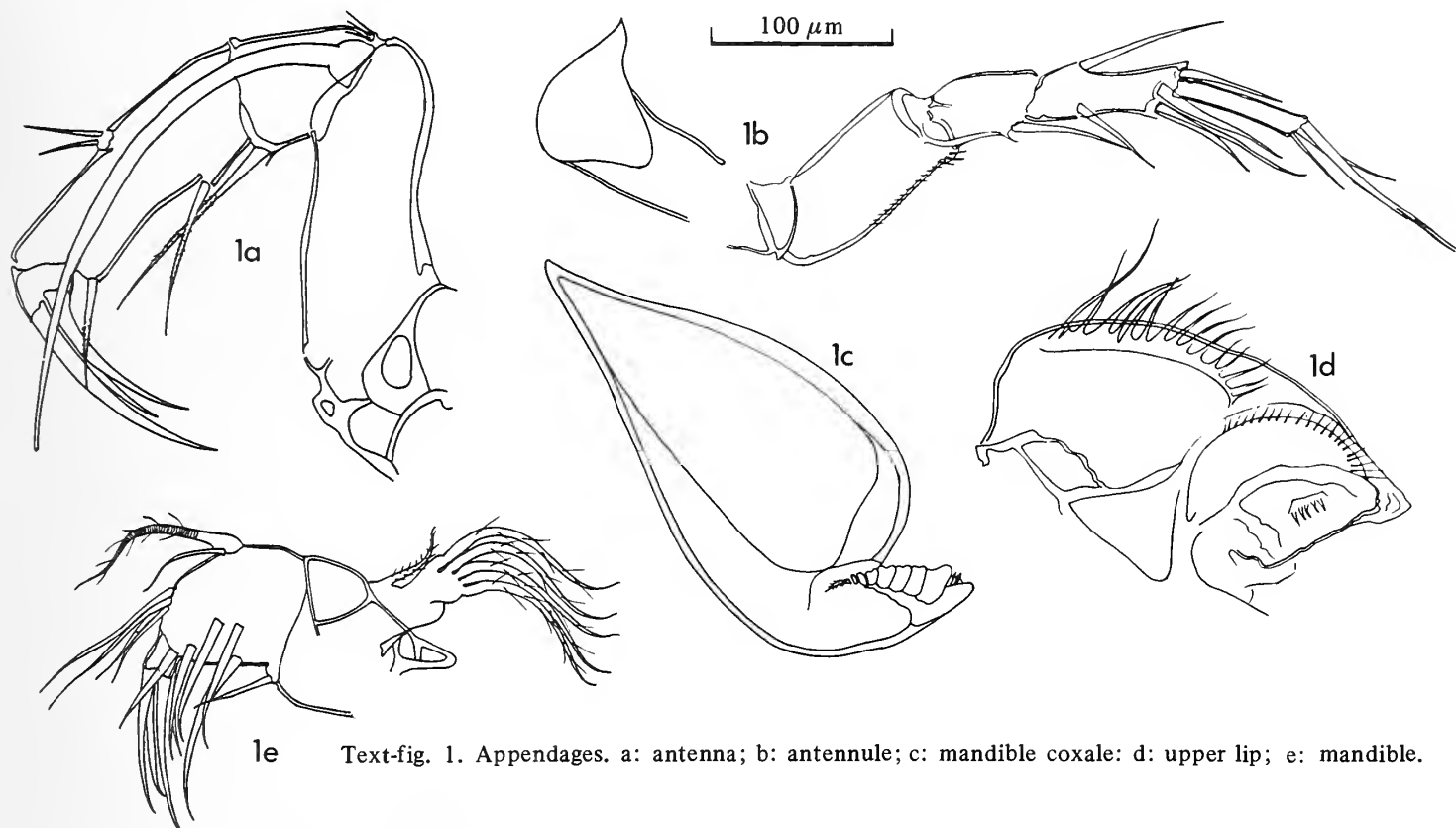
Diagnosis: Elongate ovate carapace. Dorsal margin straight in males, broadly arched in females. Antero and postero-ventral margins well rounded. The characteristic feature of the soft anatomy which distinguishes *Paralimnocythere* from other limnocytherine genera is the absence of long bristles on the posterior margins of the three walking legs (P1 – P3) as noted by Klie (*Tierwelt Dtl.*, 34, 153, 1938). More recently Petkovski (*Acta Mus. maced. Sci. nat.*, 12, 5 - 12, 1969) has recorded the presence of a rudimentary bristle on the P3 protopods of two Yugoslavian species but Klie's observation remains true for the New Zealand species.

Distribution: Known from only two localities in New Zealand; as a fossil at the type locality and living in a small pond near the glacially derived, alpine Lake Tekapo; lat. 43° 54' S. long. 170° 35' E. Alt. 708 metres.

Explanation of Plate 8, 48

Fig. 1, RV, int. lat. (paratype, TO 1135.5, 450 µm long); fig. 2, LV, int. musc. sc. (paratype, TO 1135.3 460 µm long).
Scale A (200 µm; x 200), fig. 1; scale B (25 µm; x 300), fig. 2.





ON LOMATOBOLBINA VONHACTORUM SCHALLREUTER sp. nov.

by Roger E. L. Schallreuter
(University of Hamburg, German Federal Republic)

Lomatobolbina vonhachtorum sp. nov.

Holotype: Geologisch-Paläontologisches Institut und Museum, University of Hamburg, no. **2445**, ♀ RV.
[Paratype: Ibid. no. **2446**].

Type locality: Upper Ordovician Öjlemyrflint erratic boulder no. Sy100 of the Kaolinsand (Pliocene – Pleistocene), near Braderup, Isle of Sylt (N Frisian Is., N Sea), Germany; lat. 54° 56' N, long 8° 21' E.

Derivation of name: In honour of Inge-Maria and Ulrich von Hacht, Hamburg.

Figured specimens: Geologisch-Paläontologisches Institut und Museum, University of Hamburg (GPIMH) nos. **2445** (♀ RV: Pl. 8, 52, figs. 1, 2) and **2446** (tecnomorphic LV: Pl. 8, 54, figs. 1, 2). Both from type locality; coll. by Ulrich von Hacht, 1980.

Explanation of Plate 8, 52

Figs. 1, 2, incomplete ♀ RV (holotype, GPIMH 2445, 1040 µm long): fig. 1, ext. lat.; fig. 2, ext. vent. obl.
Scale A (100 µm; x 95), figs. 1, 2.

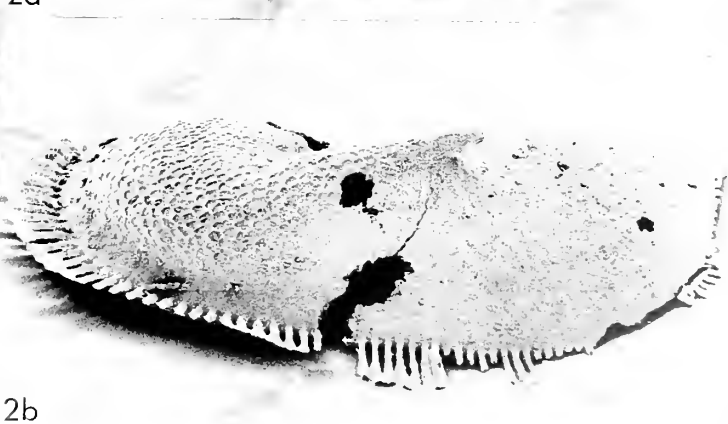
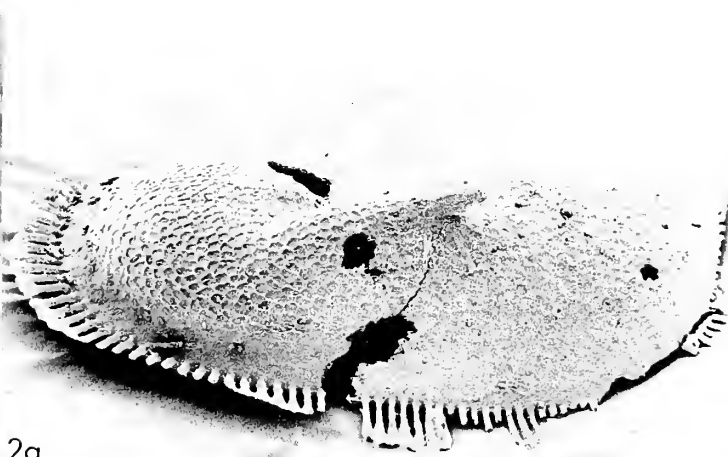
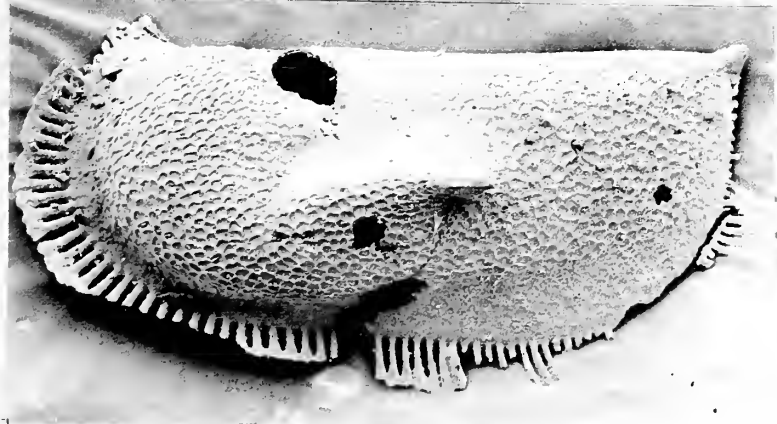
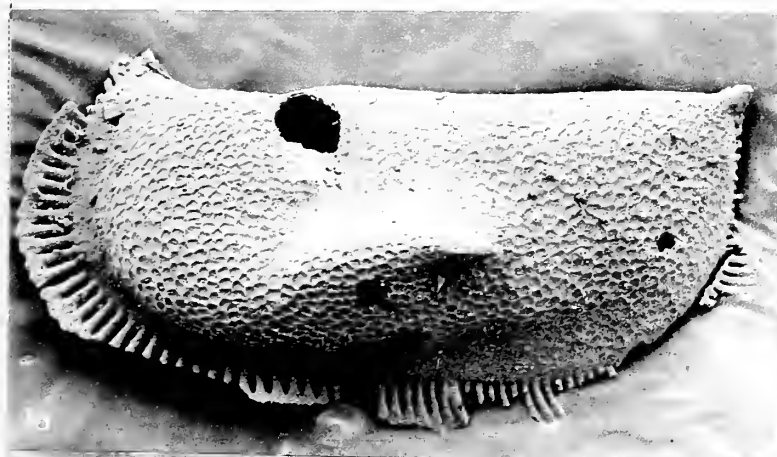
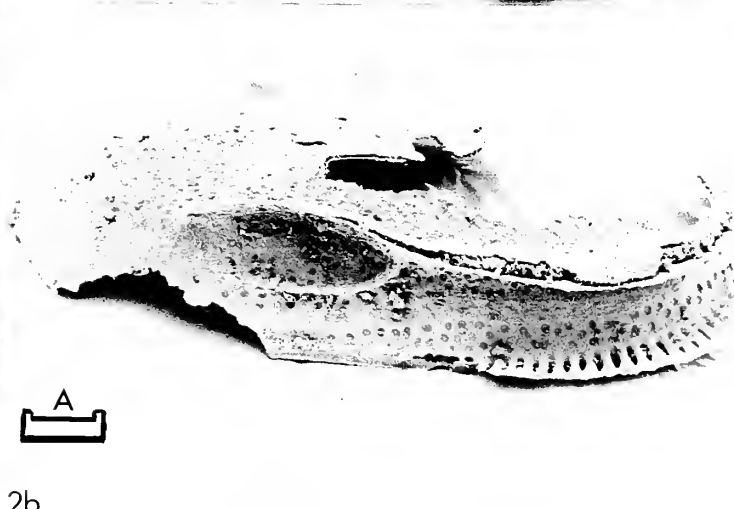
Diagnosis: Length up to 1040 µm (holotype). Tecnomorphs without velum and histium. Anteroventral and anterior centroventral region of females with velar flange continued in posterior centroventral region by short histial flange; velum in subhistial part reduced, developed only as small ridge; uniting point of velar ridge and velar/histial flange behind S2 ventral of posteroventral lobe (L3). Antra with puncta. Surface reticulate.

Remarks: *Lomatobolbina* was only previously known from the Viruan (Baltoscandian Middle Ordovician) of Sweden. The type-species of *Lomatobolbina* Jaanusson (*Bull. geol. Instn. Univ. Upsala*, **37** (3/4) resp. *Publ. Palaeont. Inst. Univ. Upsala*, **17**, 395, 1957), *Ctenobolbina mammillata* Thorslund (*Sver. geol. Unders. Ser. C* **436** [= *Årsbok* **34** (6)], 174, 1940) is larger (up to 1400 µm) and differs clearly by the presence of a tecnomorphic velar keel, a more anterior position of the joining point of the histial and velar dolon (cf. Jaanusson, *Ibid.* **43** (6/8) 7, 1967 resp. *Ibid.* **66**, 1966, text-fig. 4G-H), and the ornamentation ("minute granules, arranged in rows giving the ornamentation a minutely lineate or reticulate appearance", Jaanusson, *op. cit.*, 398 1957). In contrast to *L. mammillata* in the new species the velar dolon behind the joining point is reduced to a ridge – as in *Pentagona veloreducta* Schallreuter (*Geologie* **16** (5), 621 1967).

Distribution: Known from the type locality and Öjlemyrflint erratic boulder (G30) from the Isle of Gotland (Baltic Sea).

Explanation of Plate 8, 54

Figs. 1, 2, tecnomorphic LV (paratype, GPIMH 2446 1000 µm long without marginal and acroidal spines): fig. 1, ext. lat.; fig. 2, ext. vent. obl.
Scale A (100 µm; x 90), figs. 1, 2.



ON *POLYCOPE FRIGIDA* NEALE sp. nov.

by John W. Neale
(University of Hull, England)

Polycope frigida sp. nov.

Holotype: University of Hull coll. no. **HU.286.R.1a**, b, ♀ car. (a = valves, b = soft parts).
[Paratypes **HU.286.R.2a**, b – 6a, b].

Type locality: CENTOB NORBI Station 7, DS 14 between East Greenland and Spitsbergen, dredge sample from 76° 02.7' N, 01° 47.0' W to 76° 02.5' N, 01° 43.2' W, a distance of 1,805m, depth 3,709m. Recent.

Derivation of name: Latin, *frigidus*, cold, referring to the temperature of its habitat.

Figured specimens: University of Hull coll. nos. **HU.286.1a** (♀ car; RV: Pl. 8, 56, fig. 1; LV: Pl. 8, 56, fig. 2), **HU.286.R.2a** (♀ car; RV: Pl. 8, 58, fig. 1), **HU.286.R.2b** (appendages: Pl. 8, 59; Pl. 8, 61), **HU.286.R.3a** (juv. car; RV: Pl. 8, 58, fig. 2), **HU.286.R.4a** (♀ car; RV: Pl. 8, 60, fig. 1), **HU.286.R.5a** (♀ car; LV: Pl. 8, 60, fig. 2), **HU.286.R.6a** (♀ car; LV: Pl. 8, 62, fig. 2).

Explanation of Plate 8, 56

Fig. 1, ♀ RV, ext. lat. (holotype, **HU.286.R.1a**, 744 µm long); fig. 2, ♀ LV, ext. lat. (holotype, **HU.286.R.1a**, 660 µm long). Scale A (200 µm; x 104), figs. 1, 2.

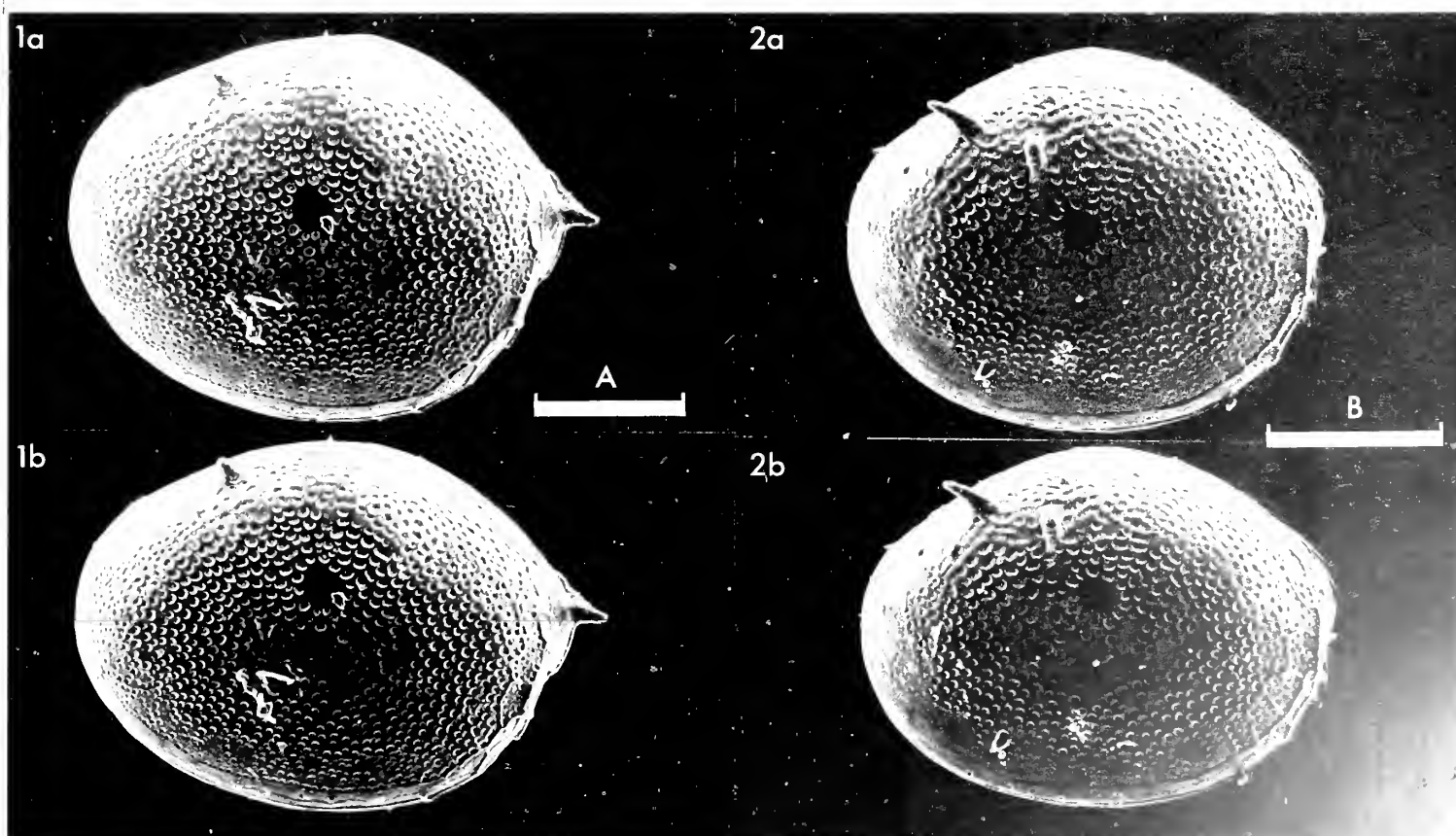
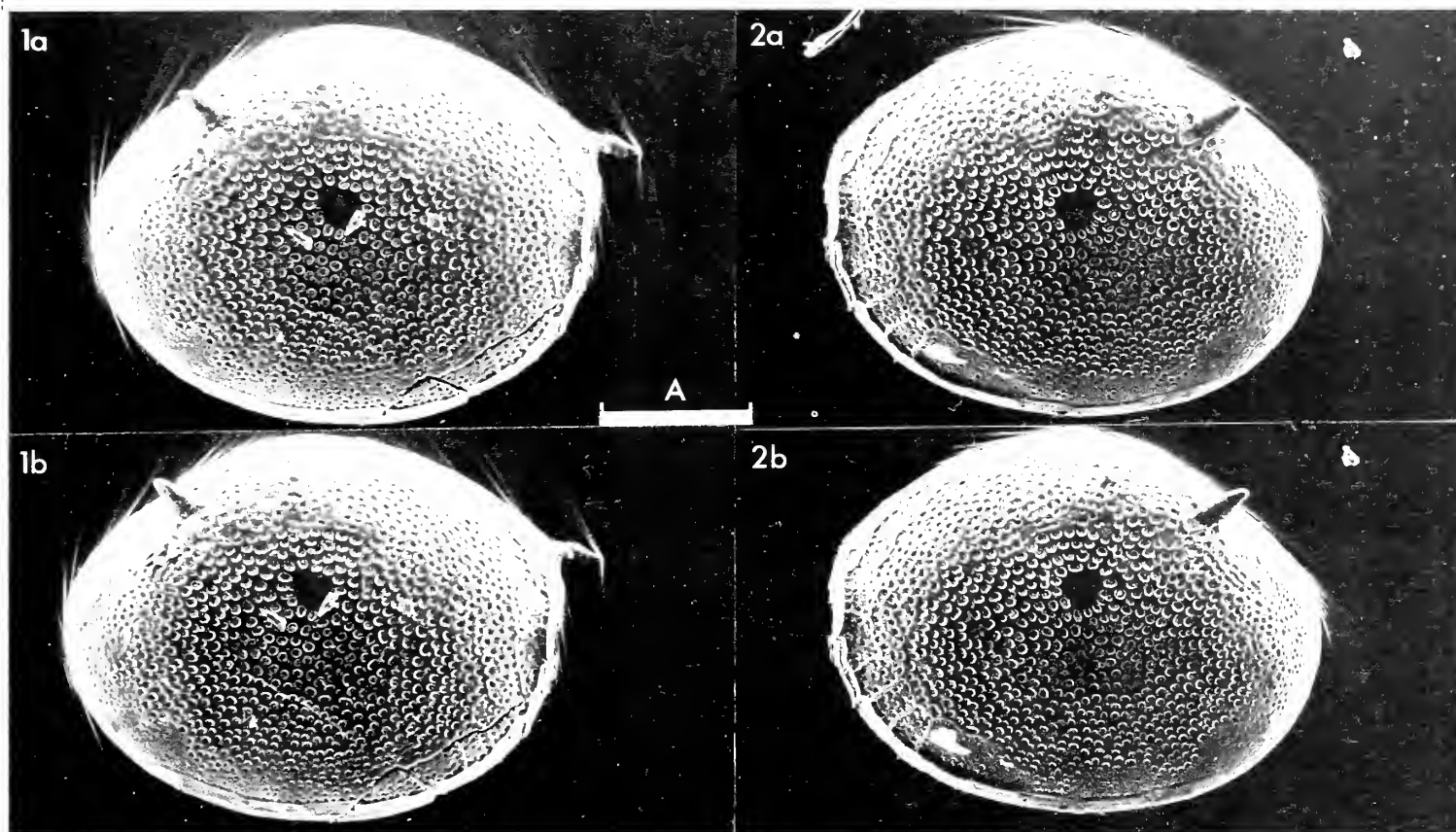
Diagnosis: Large, pitted *Polycope* with single spine developed in posterodorsal area and well-developed rostral projection in right valve at about mid-height anteriorly. Mandible *pars incisiva* strong and broad, furca somewhat rectangular with 7 main, backwardly curved spines with pilose posterior edges. Male not known with certainty.

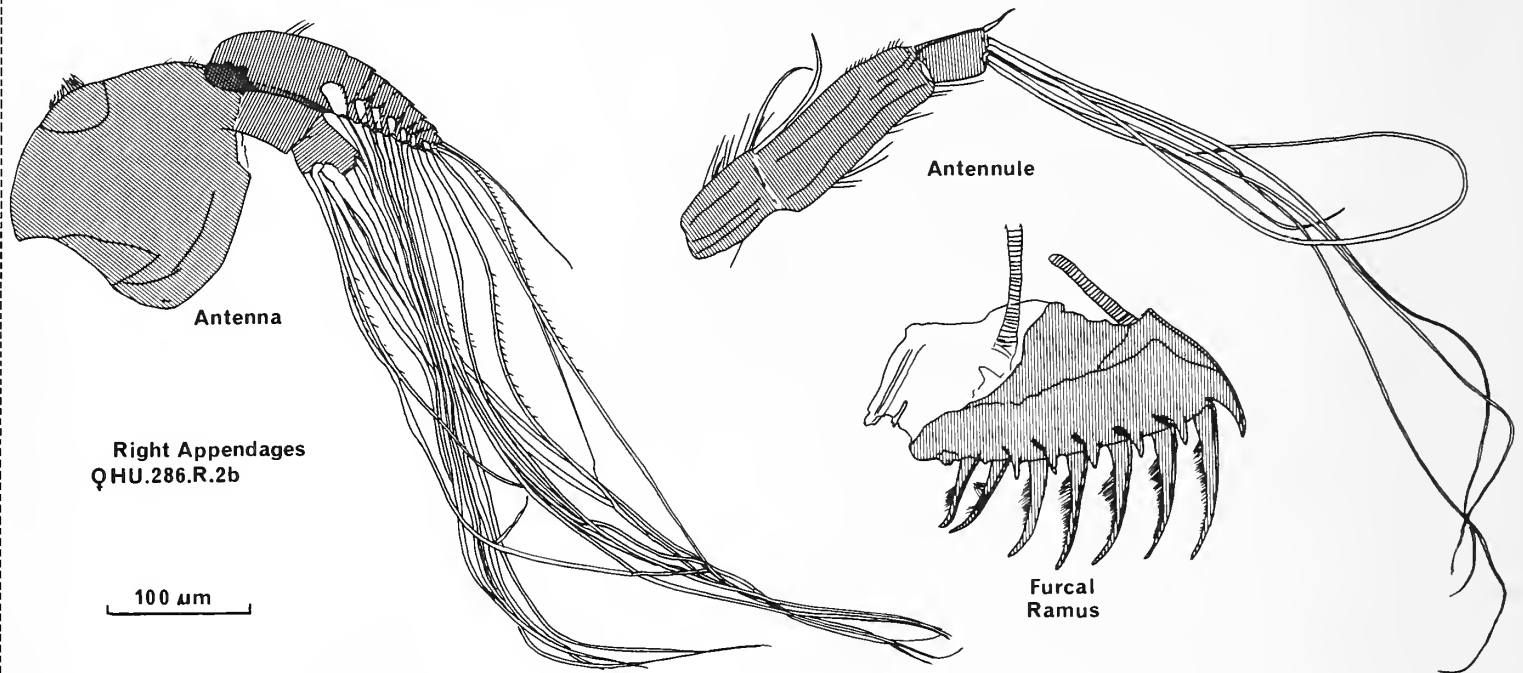
Remarks: This species is unlikely to be confused with any other. The nearest appear to be *P. bispinosa* Joy and Clark from the Central Arctic Basin and *P. punctata* Sars, first described from the Lofoten Islands but since widely recorded from the Norwegian Coast and elsewhere. The former differs in shape and in having two spines in the dorsal region of the shell and a rostral projection in the left valve. *P. punctata* differs in lacking spines on the shell, shows no rostral projection in either valve and is more equidimensional in height and width. The appendages also differ in detail as seen by reference to the mandibular palp and the furca. The present material shows the hinge in *Polycope* clearly. Closure of the valves (Pl. 8, 60, figs. 1, 2; Pl. 8, 62, fig. 2) is accomplished by a groove along the anterior, ventral and posterior margins of the RV accommodating the edge of the LV. This structure ends antero- and postero-dorsally where the RV develops elliptical terminal locating teeth delimiting the groove below. The terminations of the LV selva slot between these teeth and the edge of the RV. The dorsal margin in the RV consists of a straight bar with a groove below into which the edge of the LV fits.

Distribution: Besides the type locality *P. frigida* has also been found at CENTOB NORBI Station 10, CP 16, 73° 28.2' N, 10° 06.6' W to 73° 28.3' N, 10° 02.6' W at 2,937m. On the basis of the soft parts specimens from Station 4, DS 09, 69° 09.8' N, 04° 32.2' E to 69° 09.4' N, 04° 33.0' E between Jan Mayen and Norway at 3,211m are placed here. The males are unknown but a single decalcified specimen of *Polycope* from Station 9, KR 19, 73° 37.2' N, 07° 26.3' W at 3,294m is probably the male of this species. It has a distinctive, easily recognised furca. Present knowledge suggests that *P. frigida* is a deep, cold-water form which has so far been recovered from depths between 2,937 and 3,709 metres. At the type locality over 50 specimens of the species were associated with six specimens of *Cytheropteron alatum* Sars.

Explanation of Plate 8, 58

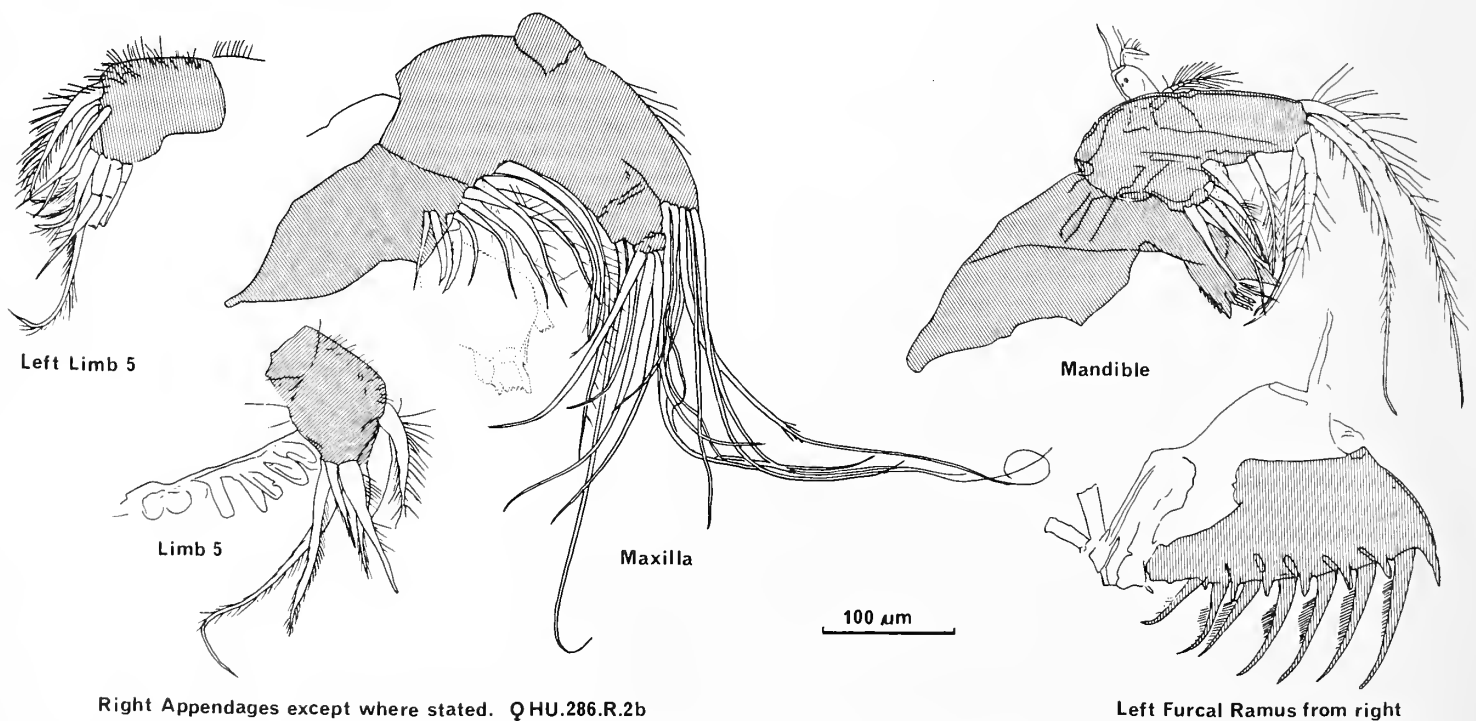
Fig. 1, ♀ RV, ext. lat. (paratype, **HU.286.R.2a**, 720 µm long); fig. 2, RV juv., ext. lat. (paratype, **HU.286.R.3a**, 553, µm long). Scale A (200 µm; x 101), fig. 1: scale B (200 µm; x 120), fig. 2.





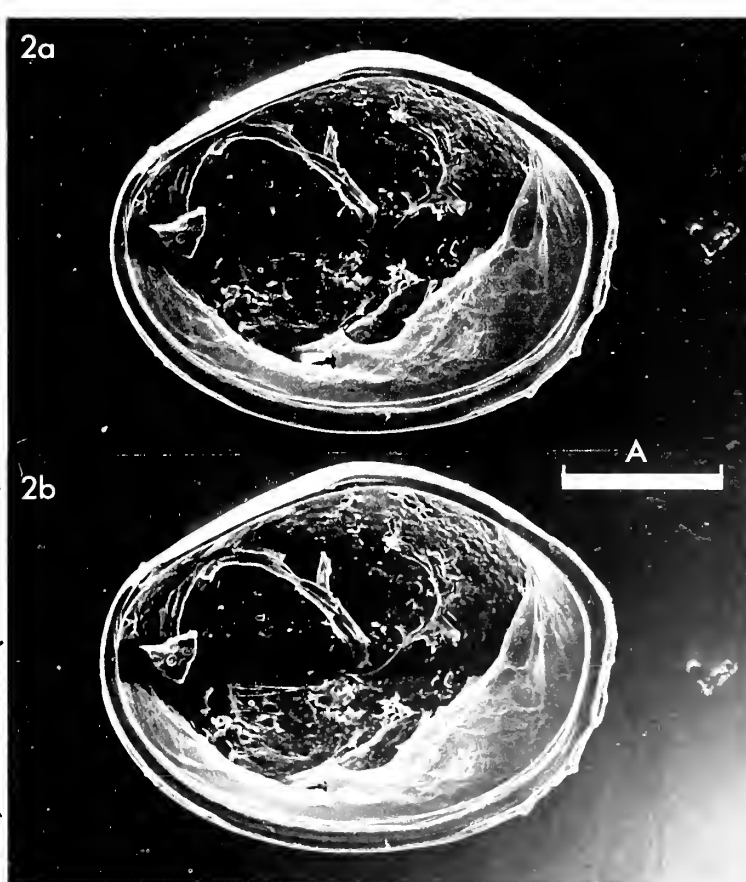
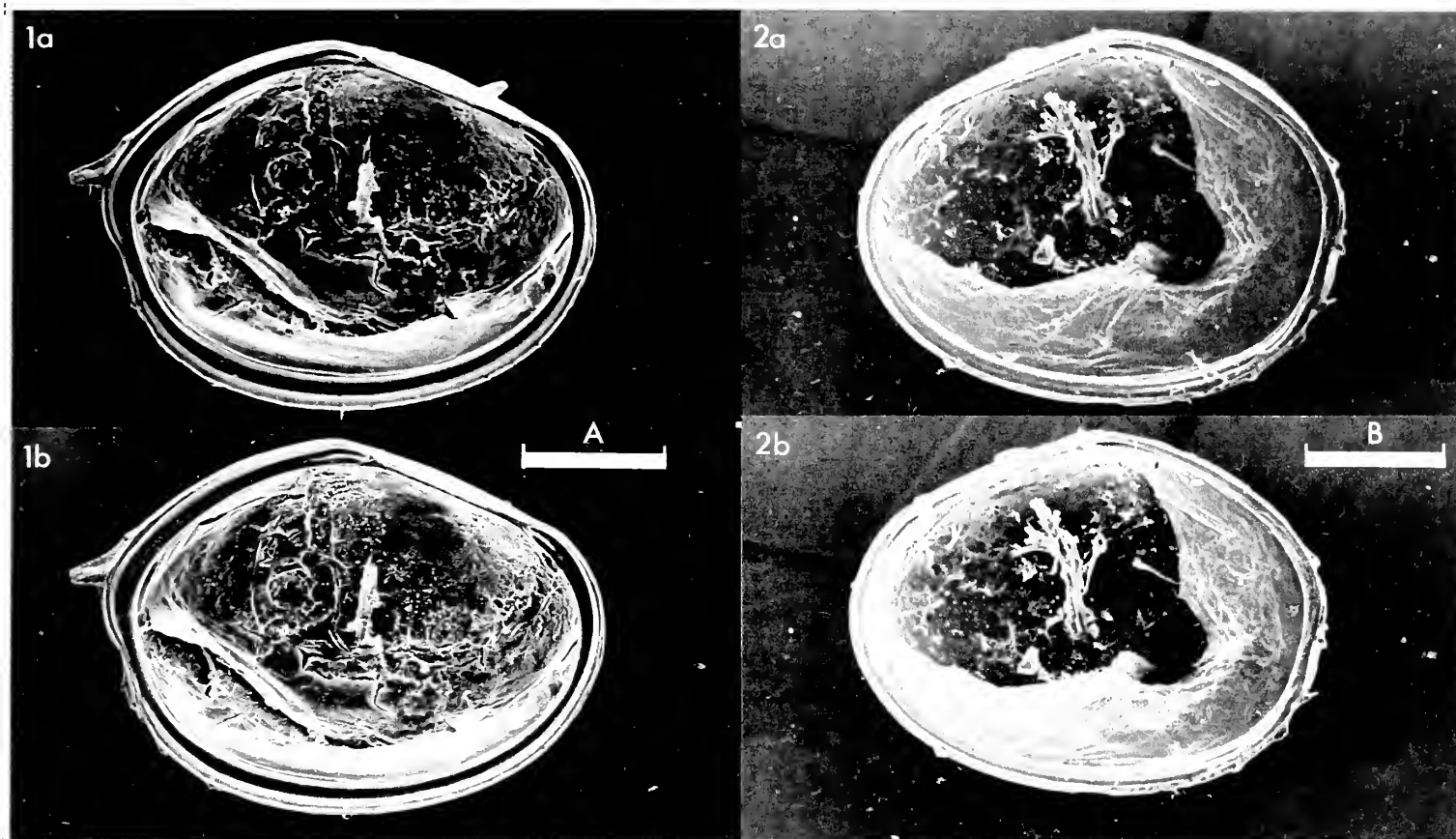
Explanation of Plate 8, 60

Fig. 1, ♀ RV, int. lat. (paratype, HU.286.R.4a, 760 μ m long); fig. 2, ♀ LV, int. lat. (paratype, HU.286.R.5a, 636 μ m long). Scale A (200 μ m; x 97), fig. 1; scale B (200 μ m; x 104), fig. 2.



Explanation of Plate 8, 62

Fig. 1, location of species; fig. 2, ♀ LV, int. lat. (paratype, HU.286.R.6a, 656 μ m long). Scale A (200 μ m; x 104), fig. 2.



ON *CARINOCYTHEREIS ANTIQUATA* (BAIRD)

by Neriman Doruk
(Ege University, Izmir, Turkey)

Carinocythereis antiquata (Baird, 1850)

- 1850 *Cythereis antiquata* W. Baird, *Ray Soc. London*, 176, pl. 20, fig. 2.
 1969 *Carinocythereis antiquata* (Baird); F. Uliczny, *Hemicytheridae und Trachyleberididae aus dem Pliozän*, Dissert. Univ. Munich, 73, pl. 4, figs. 9, 10; pl. 16, fig. 5.
 1971 *Carinocythereis* gr. *carinata* (Roemer) Form B, P. Carbonnel & J. Moyes, *Revta esp. Micropaleont.*, 3, no. 2, 148, pl. 1, figs. 2a, b; pl. 2, fig. 10.
 1972 *Carinocythereis antiquata antiquata* (Baird); H. Uffenorde, *Göttinger Arb. Geol. Paläont.*, 13, 70, pl. 7, fig. 7.

Holotype: Apparently lost (not found in Baird's collection at the Brit. Mus. (Nat. Hist.)).

Type locality: In sand on the Isle of Skye (precise locality details not known); Recent.

Explanation of Plate 8, 64

Fig. 1, ♀ RV, ext. lat. (Io 5828, 870 µm long); fig. 2, ♀ LV, ext. lat. (Io 5882, 658 µm long).
 Scale A (250 µm; x 100), fig. 1; scale B (250 µm; x 126), fig. 2.

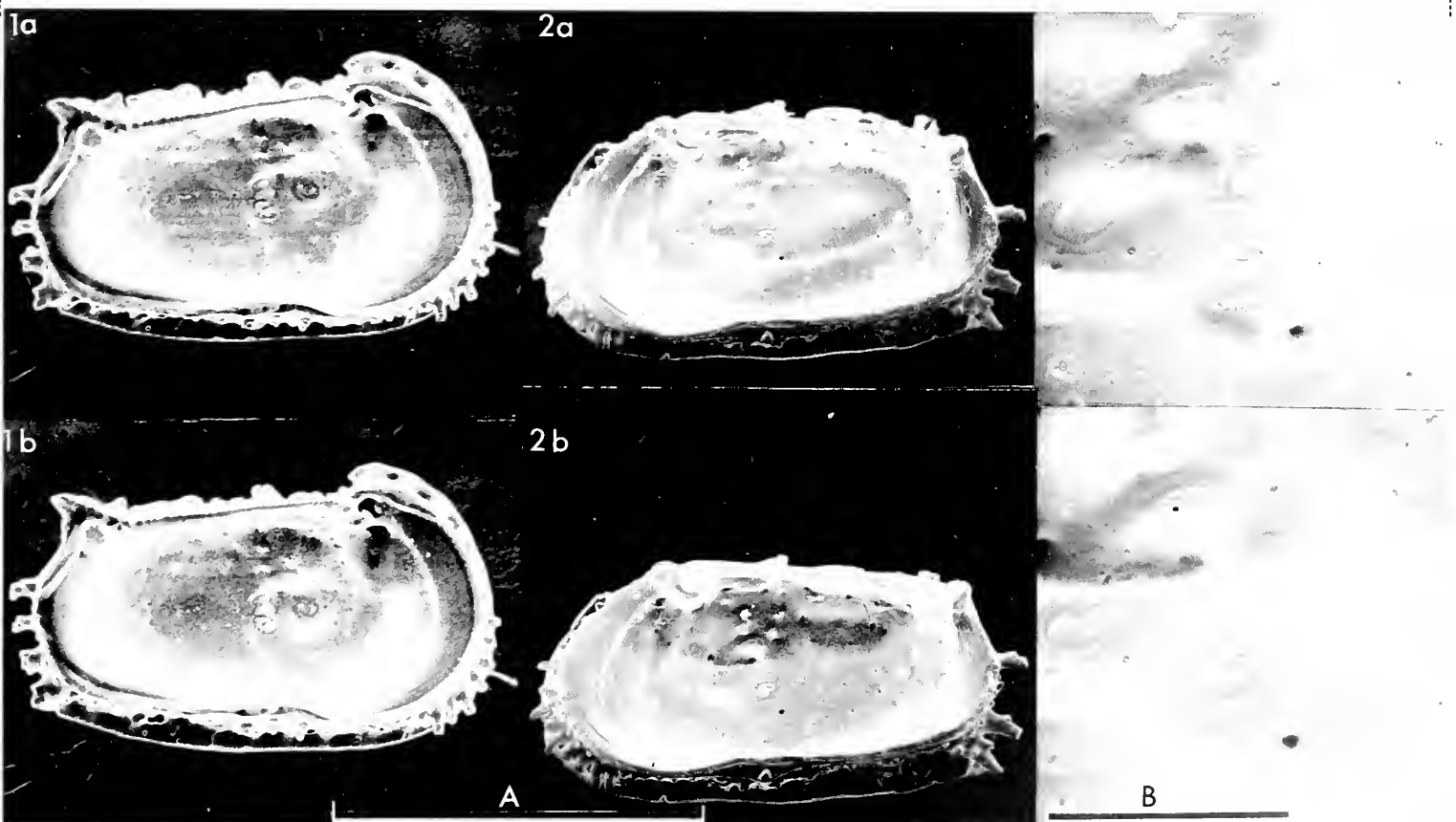
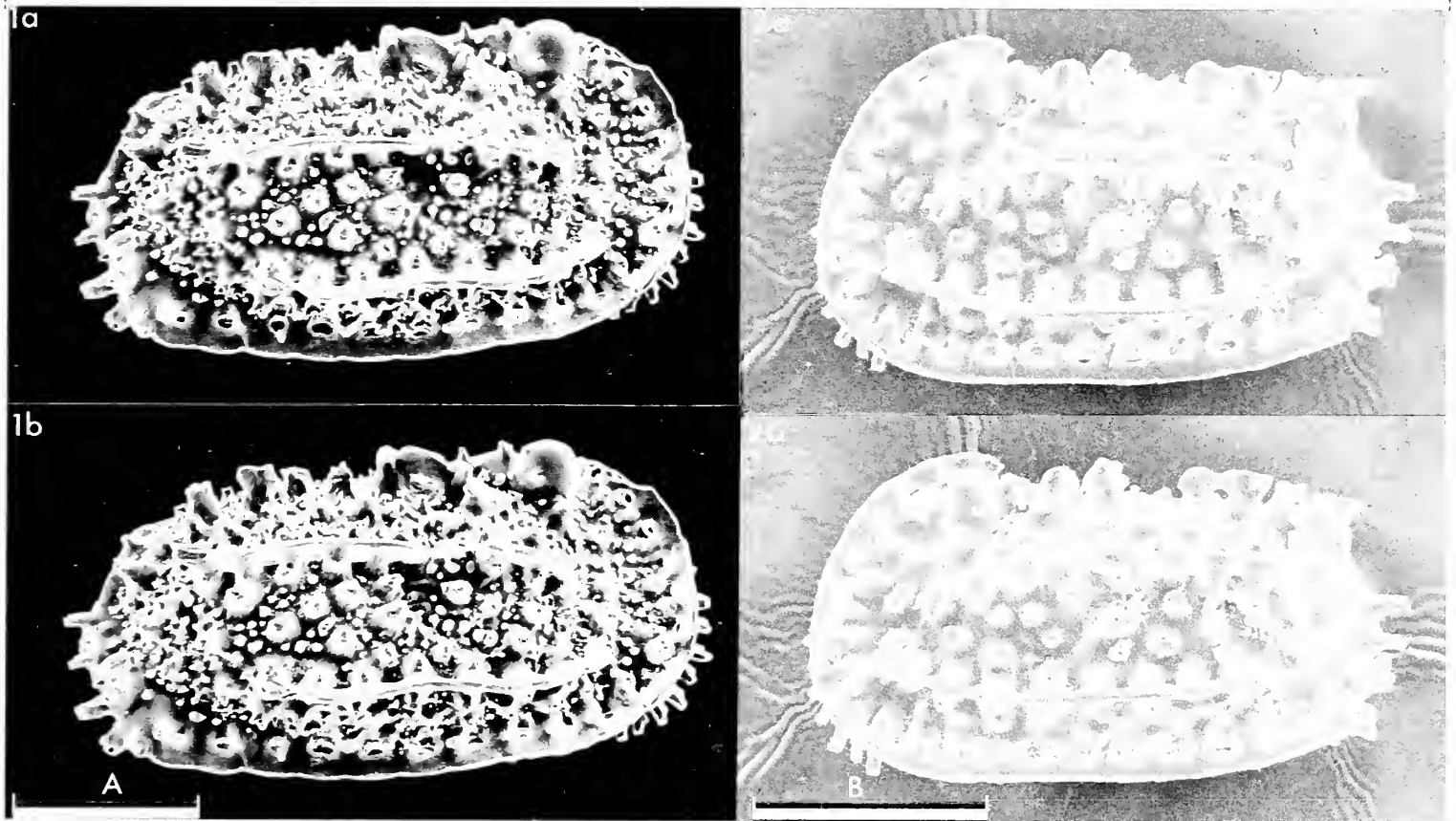
Figured specimens: Brit. Mus. (Nat. Hist.) nos. Io 5828 (♀ RV: Pl. 8, 64, fig. 1), Io 5882 (♀ LV: Pl. 8, 64, fig. 2; Pl. 8, 66, fig. 1), Io 5883 (♂ RV: Pl. 8, 68 fig. 1), Io 5884 (♂ LV: Pl. 8, 68, fig. 2). The specimen figured in Pl. 8, 70, fig. 1 is from the Isle of Skye; Recent; kindly lent by Dr. J. Whittaker from the Norman Collection, Brit. Mus. (Nat. Hist.), registration number unknown. The specimens figured in Pl. 8, 66, figs. 2, 3 and Pl. 8, 70, fig. 2, have unfortunately been lost subsequent to photography. Io 5828 and Io 5883 are from drillings off Iskenderun Bay, S coast of Turkey, depth 600 feet below sea floor; Pleistocene; presumed shallow marine. Approx. lat. 36° 07' N, long. 36° 01' E. Io 5882 and the specimen figured in Pl. 8, 66, figs. 2, 3 are from Kato-Dheutera, Cyprus, collected by the late P. C. Sylvester-Bradley; Pliocene; grey marl with molluscs and foraminifera, presumed shallow marine. Approx. lat. 35° 05' N, long. 33° 17' E. Io 5884 is from a dredge sample from Urla Bay, W coast of Turkey; Recent. Approx. lat. 38° 19' N, long. 26° 47' E.

Diagnosis: Carapace with continuous ponticulate carina around anterior and ventral margins, discontinuous ponticulate carina along dorsum and two lateral ponticulate carinae. Shell surface densely tuberculate; tubercles in form of multifurcate turrets.

Remarks: Three forms have previously been described under the name of *C. antiquata* (Baird) or *C. carinata* (Roemer) by several authors. Uliczny (1969, *op. cit.*) raised the differences to specific status and for the third erected a new species, *C. bairdii*. Carbonnel & Moyes (1971, *op. cit.*) have recognised two forms, Form A, *C. carinata* and Form B, *C. antiquata* within the specific group of *C. carinata* (Roemer).

Explanation of Plate 8, 66

Fig. 1, ♀ LV, int. lat. (Io 5882, 658 µm long); figs. 2, 3, ♀ RV (specimen lost): fig. 2, int. lat.; fig. 3, musc. sc.
 Scale A (500 µm; x 102), figs. 1, 2; scale B (100 µm; x 346), fig. 3.



Remarks: In the present material the three species are often, though not always, found together. This applies to the (contd.) Pliocene, Pleistocene and Recent sediments; I cannot, therefore, agree with the observations of Carbonnel & Moyes. The specimens of the three species all show differences in morphology and in ontogenetic development; I was unable to find any transitional forms and would therefore agree with Uliczny in considering these forms to be three distinct species.

Young instars of *C. antiquata* have the same external morphological characters as adults but are proportionally higher in the anterior half (see Pl. 8, 70, fig. 2).

Sexual dimorphism is pronounced with the males being more elongate and having a shorter ventrolateral carina, confined to the anterior third of the shell (see Pl. 8, 64, fig. 1, as compared with Pl. 8, 68, fig. 1).

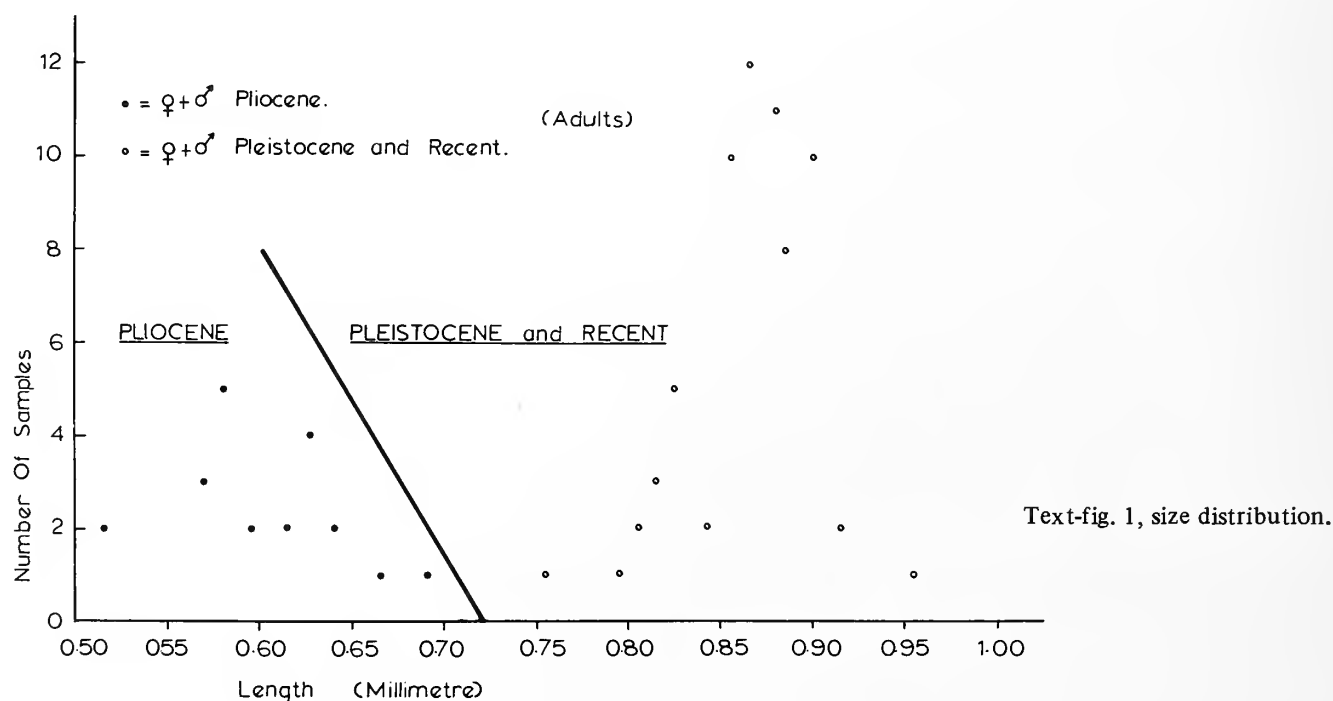
The older Pliocene forms of this species appear to be slightly smaller than their Pleistocene and Recent counterparts (see Text-fig. 1).

Distribution: A widely distributed species, occurring in the Pliocene and Pleistocene of Europe and the Recent of the Atlantic and E and W Mediterranean.

Editorial comment: Since going to press it was brought to our notice (Dr. J. Athersuch, pers. comm.) that *C. antiquata* and *C. carinata* are at present under revision by G. Ruggieri and that the results of his studies are shortly to be published; this may affect the specific status of the present species.

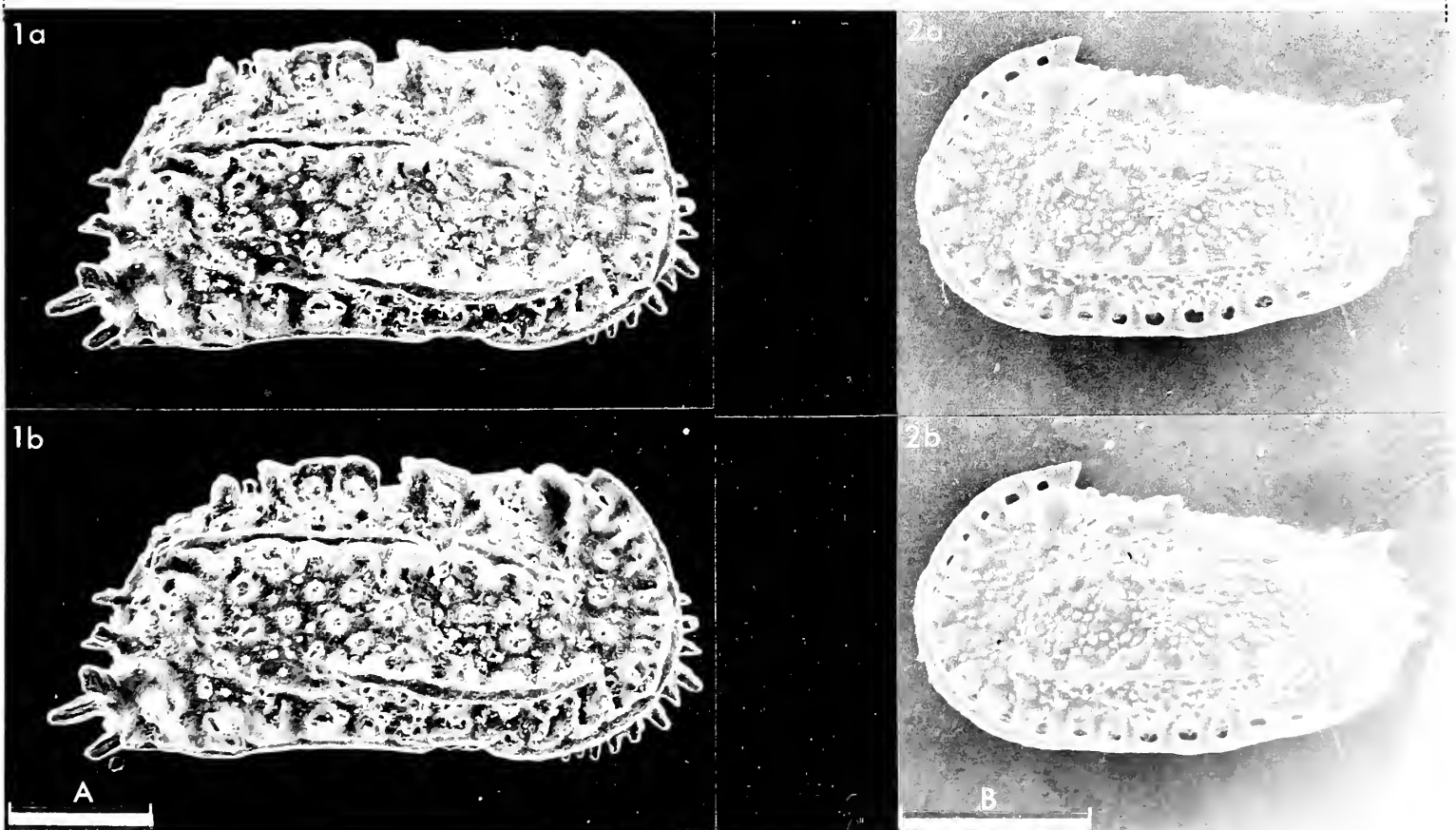
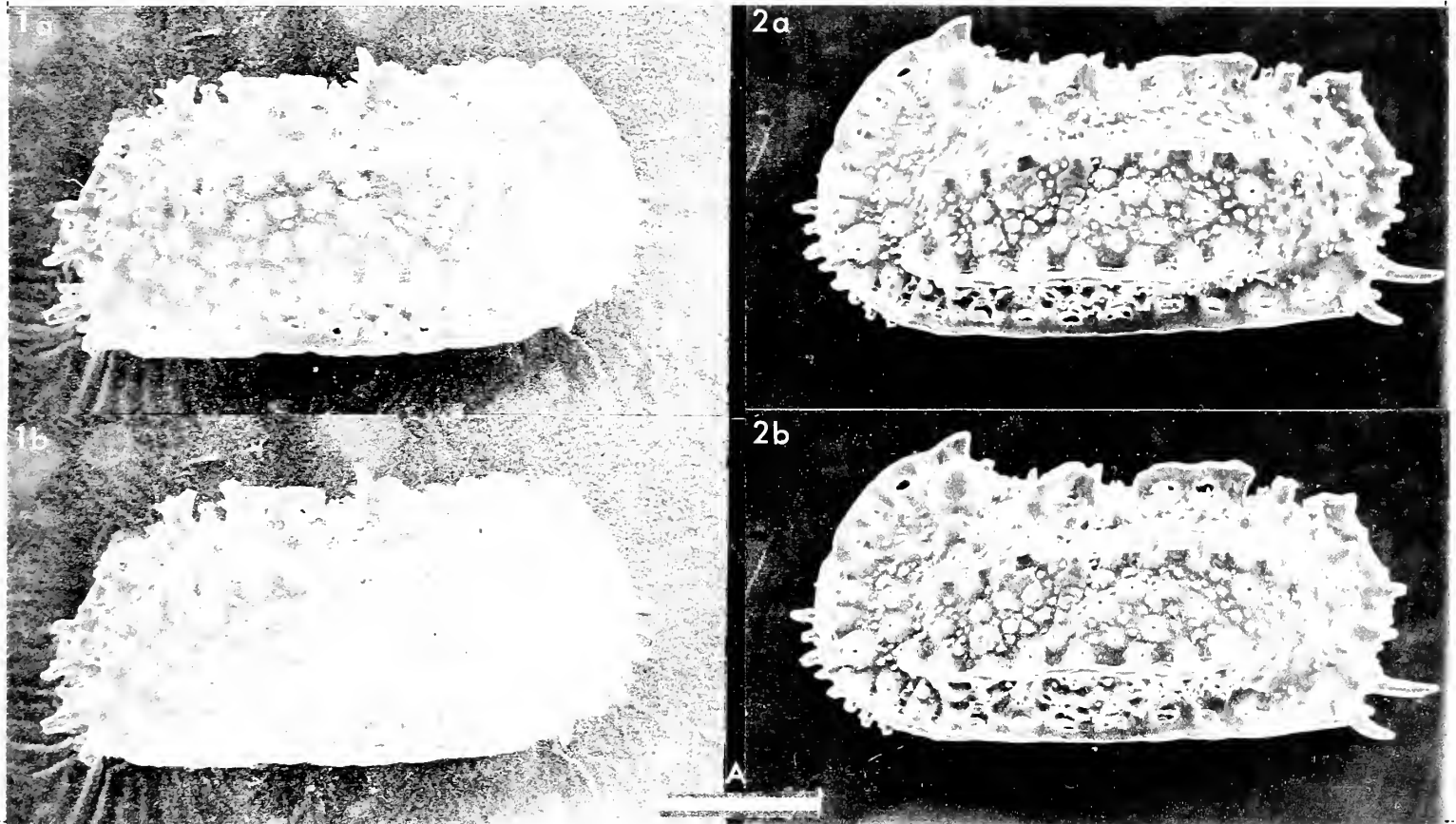
Explanation of Plate 8, 68

Fig. 1, ♂ RV, ext. lat. (Io 5883; 922 μ m long); fig. 2, ♂ LV, ext. lat. (Io 5884, 955 μ m long); Scale A (250 μ m; x 90), figs. 1, 2.



Explanation of Plate 8, 70

Fig. 1, ♂ RV, ext. lat. (1184 μ m long); fig. 2, juv. LV, ext. lat. (specimen lost). Scale A (250 μ m; x 76), fig. 1; scale B (250 μ m; x 100), fig. 2.



ON *CISTACYTHEREIS POKORNYI* (RUGGIERI)

by Neriman Doruk
Ege University, Izmir, Turkey

Cistacythereis pokornyi (Ruggieri, 1962)

- 1962 *Carinocythereis pokornyi* G. Ruggieri, *Paleont. Ital.*, 56, 2, 32, pl. 4, figs. 1 - 4.
1969 *Cistacythereis pokornyi hellenica* F. Uliczny, *Hemicytheridae und Trachyleberididae aus dem Pliozän*, Dissert. Univ. Munich, 85, pl. 7, figs. 1, 2; pl. 16, fig. 10.

Holotype: Instituto di Geologia e Paleontologia, University of Palermo, Italy no. OCR SI 1359, ♀ car.

Type locality: Enna, Italy (see Ruggieri, *op. cit.*); approx. lat. 14° 17' E, long. 37° 34' N. Grey clay with *Ostrea*, *Chlamys* and *Balanus*; Tortonian.

Explanation of Plate 8, 72

Fig. 1, ♂ RV, ext. lat. (Io 5223, 655 µm long); fig. 2, ♀ LV, ext. lat. (Io 5224, 644 µm long); fig. 3, ♂ LV, detail of papillate solum (Io 5225).

Scale A (250 µm; x 122), fig. 1; scale B (250 µm; x 128), fig. 2; scale C (100 µm; x 120), fig. 3.

Figured specimens: Brit. Mus. (Nat. Hist.) nos. Io 5223 (♂ RV: Pl. 8, 72, fig. 1; Pl. 8, 74, figs. 2, 3), Io 5224 (♀ LV: Pl. 8, 72, fig. 2), Io 5225 (♂ LV: Pl. 8, 72, fig. 3; Pl. 8, 74, fig. 1). All the specimens were collected by the late P. C. Sylvester-Bradley from Kato Dheutera, Nicosia Formation, Cyprus; grey marl with abundant molluscs and foraminifera; Pliocene. Approx. lat. 35° 05' N, long. 33° 17' E.

Diagnosis: Prominent surface ornament of deeply sculptured fossae with high ridges in between.

Remarks: Uliczny (1969, *op. cit.*) erected *C. p. hellenica* as a subspecies on the basis of different ornament (the ventral rib always being joined to the median lateral rib). In the material examined I have found considerable variation in the details of ornament (including the papillation of the sola) and therefore suggest that such a subspecies is invalid.

The adductor muscle scars, a subvertical row of 4, show a tendency to subdivide (see Pl. 8, 74, fig. 3).

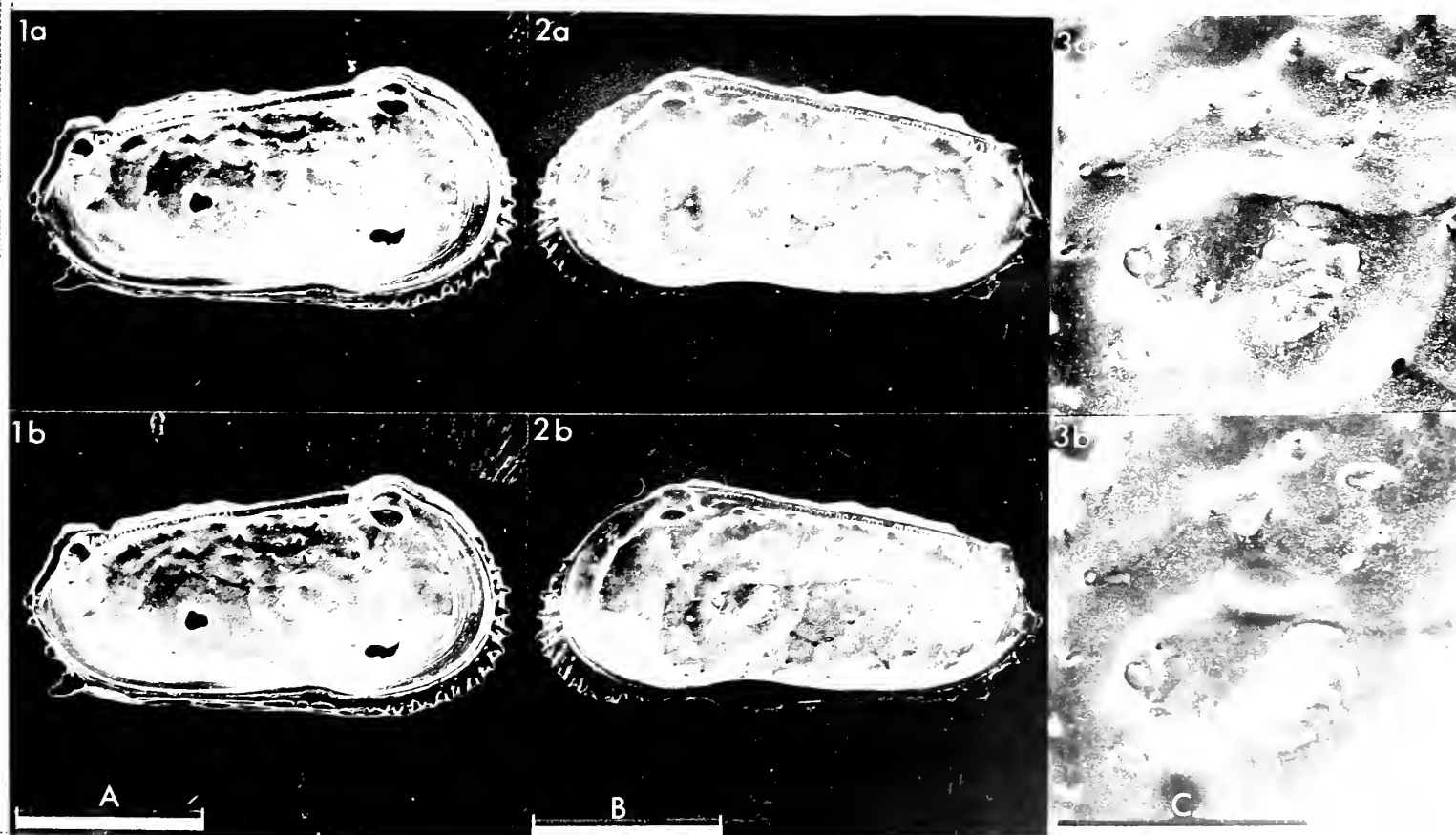
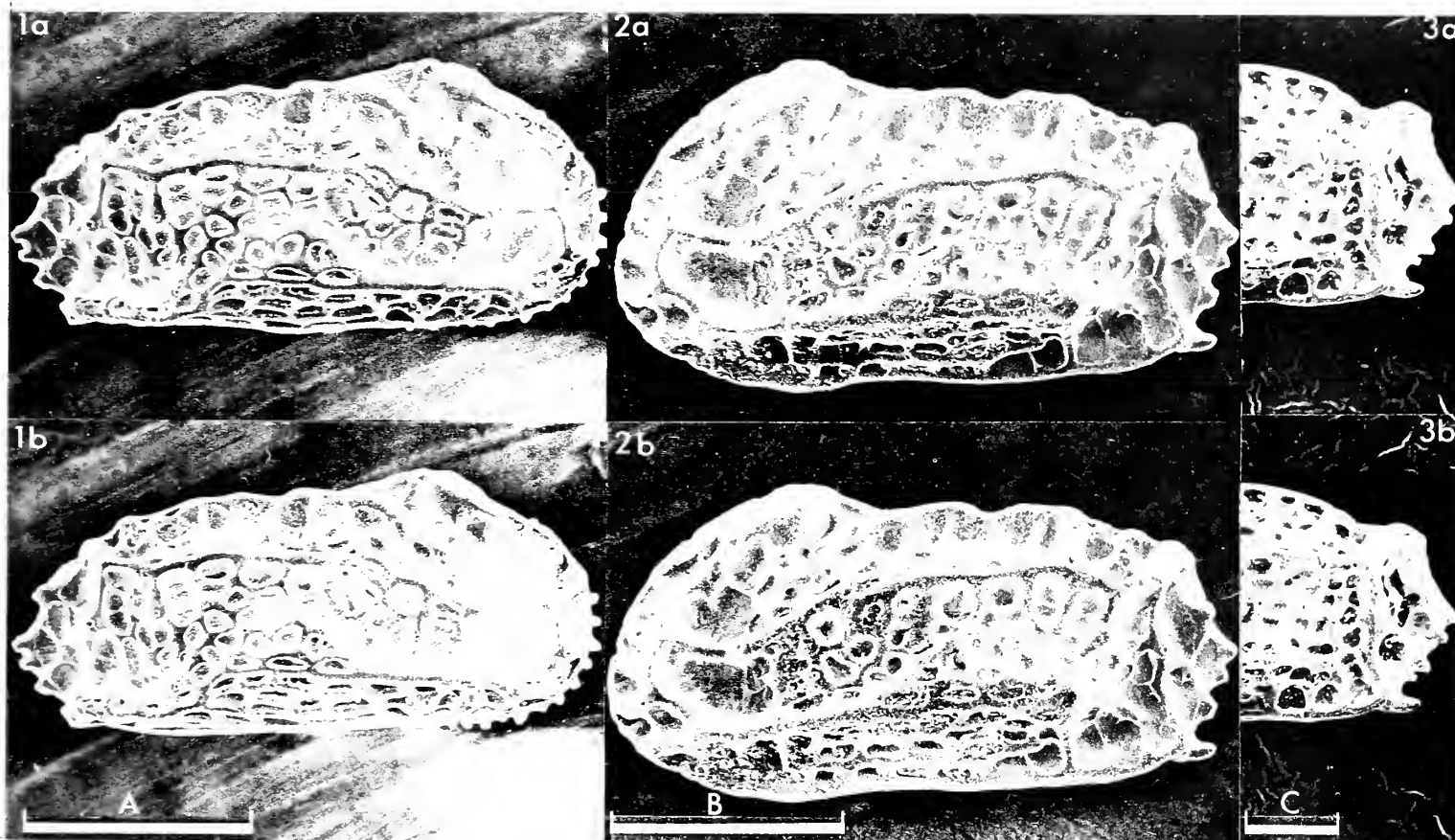
C. pokornyi differs from *C. cebrenidos* Uliczny in possessing a more pronounced ornamentation with the ventral and median ribs tending to be more strongly developed posteriorly.

Distribution: Tortonian: Italy. Pliocene: Cyprus. Pliocene to L. Pleistocene of the Aegean Islands (Sissingh, *Utrecht Micropaleont. Bull.* 6, 99, pl. 7, fig. 2).

Explanation of Plate 8, 74

Fig. 1, ♂ LV, int. lat. (Io 5225, 670 µm long); figs. 2, 3, ♂ RV, (Io 5223, 641 µm long): fig. 2, int. lat.; fig. 3, musc. sc.

Scale A (250 µm; x 100), fig. 1; scale B (250 µm; x 106); scale C (100 µm; x 350), fig. 3.



ON *CISTACYTHEREIS EQUIVALVIS* DORUK sp. nov.

by Neriman Doruk
(Ege University, Izmir, Turkey)

Cistacythereis equivalvis sp. nov.

Holotype: Brit. Mus. (Nat. Hist.) Io 5220, ♂ LV.

Type locality: Road cutting, 5km E of Salbas, Turkey, approx. lat. 37° 07' N, long. 35° 10' E. Grey marl with abundant molluscs and foraminifera, presumed shallow marine; Tortonian.

Derivation of name: Latin, pertaining to the valves of equal size.

Figured specimens: Brit. Mus. (Nat. Hist.) nos. Io 5219 (♀ RV: Pl. 8, 76, fig. 1), Io 5220 (♂ LV: Pl. 8, 76, fig. 2), Io 5221 (♂ LV: Pl. 8, 78, fig. 1), Io 5222 (♀ RV: Pl. 8, 78, fig. 2). The specimen figured in Pl. 8, 78, fig. 3 has unfortunately been lost subsequent to photography. All the figured specimens are from the type locality, 5m from the base of the section.

Explanation of Plate 8, 76

Fig. 1, ♀ RV, ext. lat. (Io 5219, 653 µm long); fig. 2, ♂ LV, ext. lat. (holotype, Io 5220, 650 µm long).
Scale A (250 µm; x 130), fig. 1; scale B (250 µm; x 126), fig. 2.

Diagnosis: Shell surface reticulate with polygonal fossae; ribs of variable strength, often no more pronounced than murae.

Remarks: The surface ribs in this species are either straight or irregular. The intramural pores are raised on pyramids which are variously developed. Marginal spines are present — 6 to 18 anteriorly and 4 to 6 posteriorly. The muscle scars comprise a subvertical row of 4 adductors and a V-shaped or divided frontal scar (see text-fig. 1).

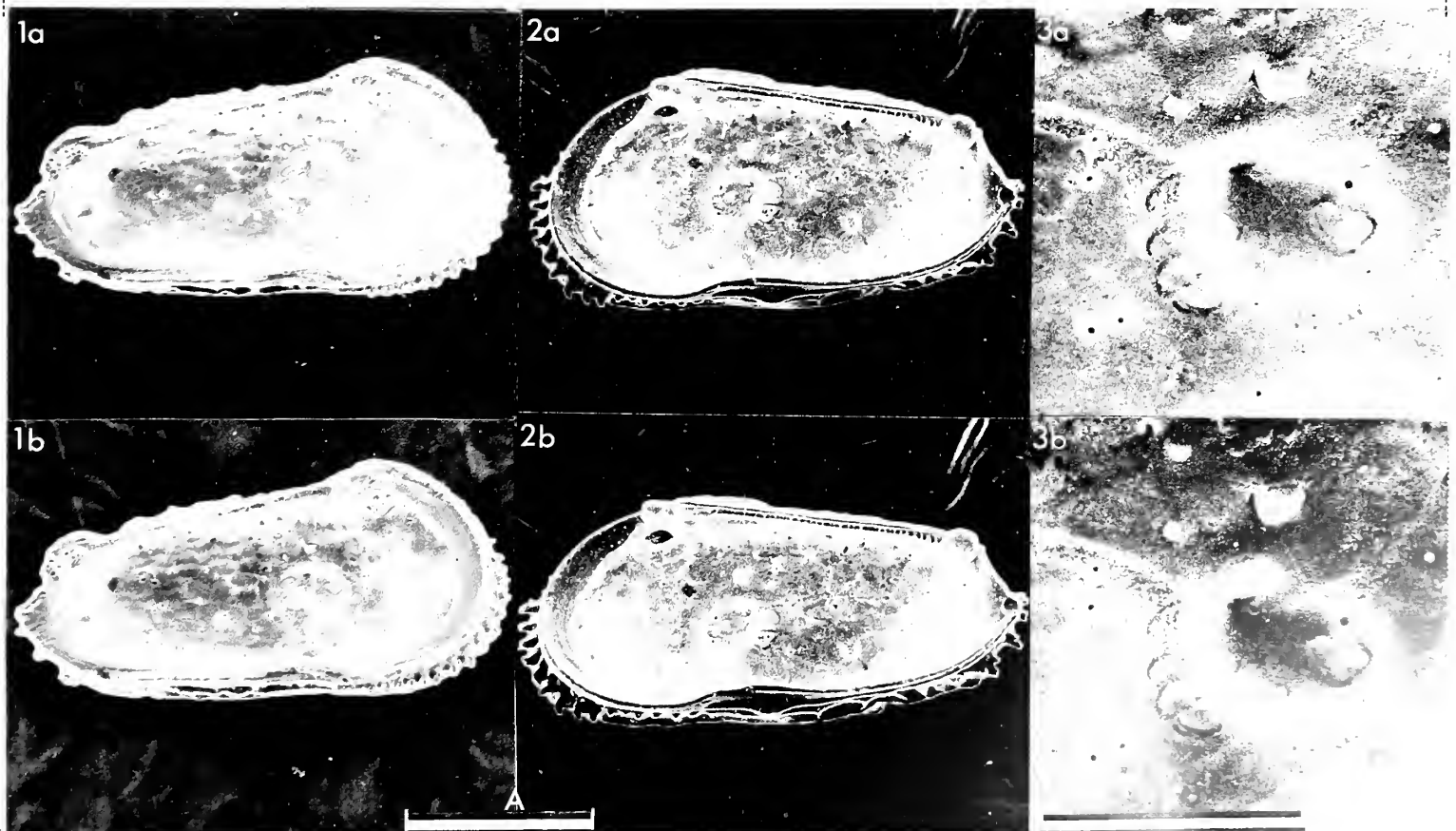
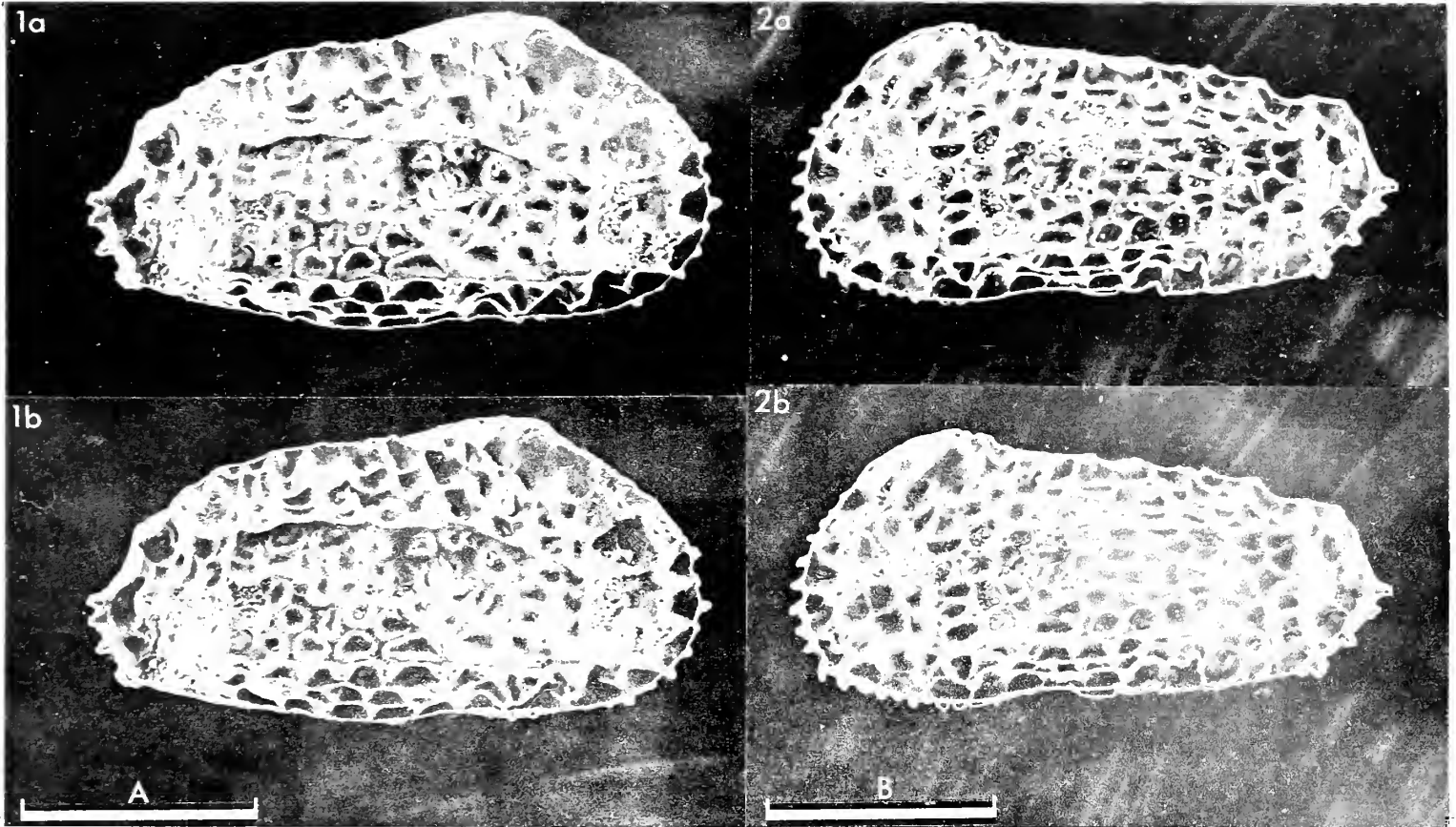
Distribution: Found only from the Tortonian in the Adana region of Turkey.

Text-fig. 1, diagrammatic representation of muscle scars of *C. equivalvis* sp. nov. (x 300).



Explanation of Plate 8, 78

Fig. 1, ♂ LV, int. lat. (Io 5221, 641 µm long); fig. 2, ♀ RV, int. lat. (Io 5222, 641 µm long); fig. 3, musc. sc. (specimen lost).
Scale A (250 µm; x 106), figs. 1, 2; scale B (100 µm; x 371), fig. 3.



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